Xth Meeting of the Child Vision Research Society

X. srečanje Društva za raziskovanje otroškega vida

CVRS 2005 PROGRAMME AND BOOK OF ABSTRACTS

Program in zbornik izvlečkov

Bled, Slovenia, June 23-25, 2005

Xth Meeting of the Child Vision Research Society

Bled, Slovenia, June 23–25, 2005

Organised by
Child Vision Research Society
and
Eye Clinic of the University Medical Centre Ljubljana

URL: http://www.cvrsoc.org/
Webmaster: Ken Kocker

Organising Committee: Branka Stirn-Kranjc (President), Jelka Brecelj, Brigita Drnovšek-Olup, Marko Hawlina, Anders Sjöström (Organiser, CVRS 2003)

Technical Organiser: Albatros Bled, Congress and Tourist Agency
Ribenska 2, SI-4260 Bled, Slovenia; www.albatros-bled.com

Programme and Book of Abstracts

Published by
Child Vision Research Society
and
Eye Clinic of the University Medical Centre Ljubljana

Editor
Branka Stirn-Kranjc

Technical Editors
Tone Žakelj, Rajko Noč

CIP - Kataložni zapis o publikaciji
Narodna in univerzitetna knjižnica, Ljubljana

617.7-053.2(063)

CHILD Vision Research Society. Meeting (10 ; 2005 ; Bled)
Programme and book of abstracts / 10th Meeting of the Child Vision Research Society - CVRS 2005, Bled, Slovenia, June 23-25,2005 ;
organized by Child vision society and Eye clinic of the University Medical Centre Ljubljana ;
editor Branka Stirn-Kranjc. - London : Child Vision Research Society ;
Ljubljana : Eye Clinic of the University Medical Centre, 2005

ISBN 961-6442-10-4
1. Stirn-Kranjc, Branka 2. Klinični center. Očesna klinika
(Ljubljana)

220928512

Xth Meeting of the Child Vision Research Society

X. srečanje Društva za raziskovanje otroškega vida

Programme and Book of Abstracts

Program in zbornik izvlečkov

Golf Hotel Bled, Slovenia, June 23–25, 2005

Hotel Golf, Bled, 23.–25. junij 2005

Dear fellow CVRS members, guests and companions!

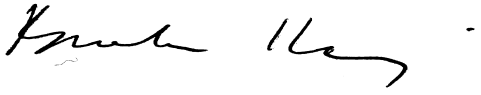
A warm welcome to the Xth CVRS Meeting and to wonderful Bled! On behalf of the Organising Committee, I hope that you will experience an enjoyable stay in Slovenia.

We have tried to mix the scientific and social programme in a way that would allow you to meet colleagues and friends in the child vision research in a relaxed atmosphere. It is our hope that this will stimulate you to exchange your experiences in child vision and discuss recent advances in your research field.

The organisers gratefully acknowledge all the CVRS members who have supported the organisation of this jubilee meeting in Slovenia. The idea of bringing together leading scientists, both basic and clinical, from all around the world to share their knowledge in the field of the child's visual world goes back to the 1980's and it is our privilege to host the Xth CVRS Meeting in Bled, our pearl of the Alpine region. Special thanks go to you, the presenting authors and co-authors, who have contributed to an exciting and stimulating scientific programme.

The organisers also acknowledge the generous support of our advertisers, exhibitors, and sponsor – among them the Ministry of Science, Education and Sports. Special thanks to the technical organiser, Congress and Tourist Agency Albatros Bled, who have proven and will prove again their ability to provide professional services for a successful meeting.

Being honoured to be able to greet you as our distinguished guests and friends in Bled, I am kindly inviting you to the scheduled scientific and social programme.



Branka Stirn-Kranjc
President, Organising committee CVRS 2005

Xth Child Vision Research Society Meeting 2005, Golf Hotel, Bled, Slovenia, June 23–25, 2005

X. srečanje Društva za raziskovanje otroškega vida, Hotel Golf, Bled, 23.–25. junij 2005

Programme and Book of Abstracts

Program in zbornik izvlečkov

Thursday, June 23, 2005 / Četrtek, 23. junij 2005

Morn. / Dop. **Optional Tours / Možnost za izlete**

17.00 **Registration & Get-together / Prijava in zbor**

19.00 **Welcome Reception / Dobrodošlica**

Friday, June 24, 2005 / Petek, 24. junij 2005

07.45 **Registration / Prijava**

08.45 **Welcome to CVRS 2005 / Pozdravni nagovor**
Opening of the Meeting / Odprtje srečanja

08.55–10.05 **Session 1 / Zasedanje 1** **Page / Stran**
Chairpersons / *Voditelja*: M. Dik and M. J. de Vries

10.05–10.30 **Poster Inspection & Coffee Break / Ogled plakatov in odmor s kavo**

10.30–12.15 **Session 2 / Zasedanje 2**
Chairpersons / *Voditelja*: R. Sireteanu and M. Nardini

19.30 **Visit to the Medieval Castle Bled & Dinner / Obisk blejskega gradu in večerja**

Saturday, June 25, 2005 / Sobota, 25. junij 2005

08.30–10.10 **Review Lectures / Pregledna predavanja**

10.10–10.30 **Poster Inspection & Coffee Break / Ogled plakatov in odmor s kavo**

10.30–12.30 **Session 6 / Zasedanje 6**
Chairpersons / *Voditelja*: J. Brecelj and D. Thompson

M. Tekavčič-Pompe, B. Stirn-Kranjc, J. Brecelj
AGE-RELATED CHANGES OF CHROMATIC VEP IN SCHOOLCHILDREN 37
SPREMINJANJE VIDNIH EVOCIRANIH POTENCIALOV NA BARVNI DRAŽLJAJ S STAROSTJO ŠOLARJEV

12.30–14.00 **Lunch / Kosilo**

14.00–14.30 **CVRS General Assembly, CVRS 2007 / Zasedanje skupščine CVRS, srečanje CVRS 2007**

14.30–15.15 **Session 7 / Zasedanje 7**
Chairpersons / *Voditelja*: S. Anker and K. Breckenridge

K. Breckenridge, J. Atkinson, S. Anker, O. Braddick
DEVELOPING TESTS OF ATTENTION FOR PRESCHOOL CHILDREN 38
TESTI RAZVOJA POZORNOSTI PRI PREDŠOLSKIH OTROCIH

S. Anker, J. Atkinson, K. Breckenridge, O. Braddick
ATTENTIONAL DEFICITS IN TWO COHORTS OF 6 YEAR OLD CHILDREN (A) IDENTIFED FROM INFANT VISION SCREENING WITH SIGNIFICANT REFRACTIVE ERRORS (B) BORN PREMATURELY 39
IZPADI POZORNOSTI V DVEH KOHORTAH 6-LETNIKOV – A) V SKUPINI Z VELIKIMI REFRAKCIJSKIMI NAPAKAMI, ODKRITIMI MED PRESEJANJEM OTROK ZA VIDNE MOTNJE, IN B) PRI OTROCIH, KI SO SE RODILI NEDONOŠENI

15**.15–15.45** **Poster Inspection & Coffee Break / Ogled plakatov in odmor s kavo**

15.45–17.15 **Session 8 / Zasedanje 8**
Chairpersons / *Voditelja*: C. Harris and D. Thibault

C. Harris, F. Budge, N. Derbyshire, S. Garbutt
DEVELOPMENT OF THE SACCADIC MAIN SEQUENCE 41
RAZVOJ GLAVNE SAKADNE SEKVENCE

D. Thibault, O. Brosseau-Lachaine, J. Faubert, F. Vital-Durand
IS THE DEVELOPMENT OF FIRST- AND SECOND-ORDER MOTION DIFFERENTIALLY AFFECTED BY MONOCULAR VIEWING AND STRABISMUS? 42
ALI NA RAZVOJ ZAZNAVANJA GIBANJA PRVEGA IN DRUGEGA REDA VPLIVATA MONOKULARNI VID IN STRABIZEM?

D. Birtles, J. Wattam-Bell, J. Atkinson, O. Braddick
GLOBAL MOTION AND FORM PROCESSING: RELATIVE DEVELOPMENT BETWEEN 4–11 YEARS AND ADULT 43
PROCESIRANJE GLOBALNEGA GIBANJA IN OBLIKE: RAZVOJ V STAROSTI 4–11 LET IN STANJE PRI ODRASLEM

A. Guzzetta, F. Tinelli, R. Chillemi, A. Bancale, G. Cioni
DEFICITS OF MOTION PERCEPTION IN CHILDREN WITH PERIVENTRICULAR LEUKOMALACIA 44
POMANJKLJIVO ZAZNAVANJE GIBANJA PRI OTROCIH S PERIVENTRIKULARNO LEVKOMALACIJO

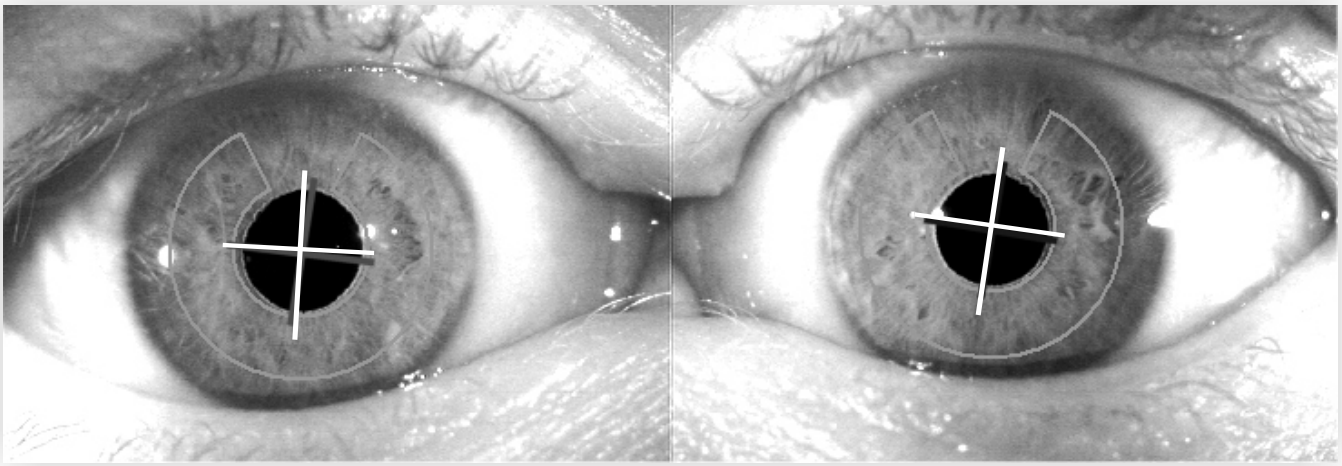
17.15 **Closing Remarks / Zaključne misli**

Optional Tours / Izleti

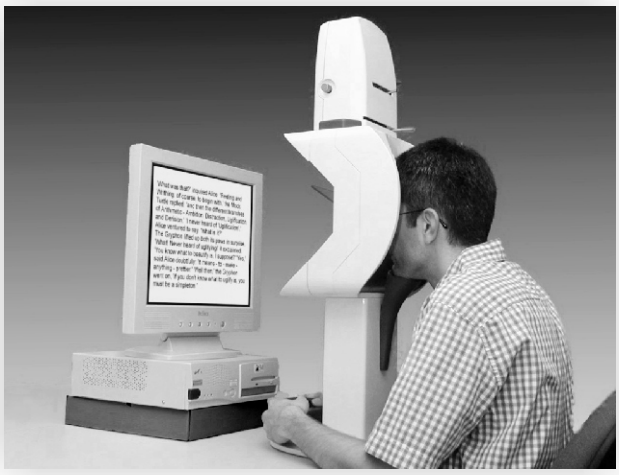
Posters / Plakati

1. U. Yinon, N. Gurshumov
AN ANIMAL MODEL FOR DEVELOPMENT OF SCOTOPIC DOMINANT MECHANISM IN THE VISUAL SYSTEM 47
ŽIVALSKI MODEL ZA RAZVOJ SKOTOPIČNEGA DOMINANTNEGA MEHANIZMA VIDA

Looking for ways to measure eye movements?



We have all you need!



iView X™ Hi-Speed

- High Speed Eye Tracking
- Ultra-High Accuracy
- High Stability Over Time

3D VOG Version 5

- Binocular Online Torsion
- 6D Head Motion Sensor
- Nystagmus Analysis
- Strabismus Analysis (coming soon)

SensoMotoric Instruments GmbH
Berlin Office
Teltow / Germany
Phone: +49-3328-3955-10
E-Mail: info@smi.de
Web: www.smi.de

SMI
SensoMotoric Instruments

Lectures / Predavanja

Digital slit lamp: HawkEye

Optotek and Dioptrix are proud to announce an exciting new product:

the first-ever portable cold light slit lamp with internal digital camera

An internal digital camera enables you:
- store pictures
- transfer pictures
- share over the Internet
- communicate with the patient

Portability of HAWK-EYE enables you to:
- difficult or disabled patients
- young children
- injured persons

The finest details become easily visible!

Optotek d.o.o.
Stegne 13a
1000 Ljubljana, Slovenia
tel.: +386 1 500 14 00
fax: +386 1 500 14 01
e-mail: optotek@optotek.si
on-line: www.optotek.si

Dioptrix
13, rue d'Ariane
ZA Montredon 31240 L'Union, France
tel: +33 (0) 534 301 244
fax: +33 (0) 561 610 995
e-mail: info@dioptrix.com
on-line: www.dioptrix.com

PATHOLOGY IN A POPULATION OF VISUALLY IMPAIRED AND BLIND CHILDREN (4–20 YEARS) ATTENDING SCHOOL

PATOLOŠKA STANJA, KI SO VZROK ZA SLABOVIDNOST ALI SLEPOTO MED ŠOLAJOČIMI SE OTROKI V STAROSTI 4–20 LET

M. J. de Vries

Visio, National Foundation for the Visually Impaired and Blind, Amsterdam Zuid-Oost, The Netherlands

Purpose: To gain insight in the pathology of a population of visually impaired and blind children who are attending two special schools (KIOSB, Comeniusschool) or who received aid from these schools at their own school (AOB).

Subjects: Four hundred and fifty-four children between 4 and 20 years of age matching the above mentioned criteria in the year 2000.

Methods: The diagnoses were categorized according to the cause (genetic/non genetic, uncertain, acquired) and the period of in the development of the child in which the pathology was most likely to originate (prenatal/perinatal/postnatal).

Results:

Cause of the pathology – September 2000	*KIOSB*	*Comeniusschool*	*AOB*
Prenatal, genetic	37.0%	55.7%	69.2%
Prenatal, acquired (b.e. intrauterine infection)	1.1%		1.2%
Prenatal genetic?/acquired?	17.9%	33.3%	12.8%
Total prenatal	**56.0%**	**89.0%**	**83.2%**
Perinatal, ROP	15.4%	3.3%	2.4%
Perinatal, other	13.8%	1.1%	6.8%
Total perinatal	**29.2%**	**4.4%**	**9.2%**
Total postnatal	**13.7%**	**4.4%**	**3.6%**
Unknown	**1.1%**	**2.2%**	**4.0%**
	100.0%	100.0%	100.0%

Conclusions: The main cause of the pathology in this population is prenatal and genetic. The data will be presented and discussed in more detail and are open for discussion.

EARLY CHILDHOOD VISUAL FUNCTION REHABILITATION IN NOORD-HOLLAND: PRACTICE AND PROBLEMS

REHABILITACIJA VIDA V ZGODNJEM OTROŠTVU V POKRAJINI NOORD-HOLLAND: DELO IN TEŽAVE

M. Dik

Visio, Amsterdam, The Netherlands

Purpose: To inform researchers about day to day practice and problems in rehabilitation and show some of our research needs.

Material and Method: Analysis of the developments in our population visual impaired children.

Results: For the first time the yearly analysis of our population revealed the children with CVI outnumbering the children with ocular or praechiasmatic problems. A change is taking place.

ALTERNATIVE COMMUNICATION SYSTEM IN CHILDREN WITH SEVERE CEREBRAL PALSY AND LOW VISUAL FUNCTION: A CASE REPORT

NADOMESTNI SISTEM KOMUNAKICIJE ZELO SLABOVIDNIH OTROK S HUDO CEREBRALNO PARALIZO: POROČILO O PRIMERU

K. Groleger-Sršen[1], B. Stirn-Kranjc[2], B. Korošec[1], J. Brecelj[2], Z. Pihlar[1]

[1]*Institute for Rehabilitation, Ljubljana, Slovenia*
[2]*Eye Clinic, University Medical Centre Ljubljana, Ljubljana, Slovenia*

Background: It is estimated that 80–90% of early learning is based on visual input. Premature birth is a major risk factor of severe visual impairment in childhood. For children with multiple disabilities in motor development, sensory-motor integration, language development, learning disabilities, and problem solving the task of meaning-making is very challenging. Augmentative and alternative communication (AAC) refers to ways (other than speech) that are used to send a message from one person to another. The goal is the most effective communication possible.

Aim: To present a case of 5 year old girl with severe cerebral palsy, who is able to use AAC.

History: A girl was born after 1st pregnancy as gemini A. During pregnancy gestational diabetes, IUGR and oligohidramnion were found. Labour started spontaneously at 34th wks and was terminated with caesarean section. Amniotic

fluid was meconic. The girl was intubated and ventilated due to serious respiratory distress syndrome. Head US showed bilateral periventricular flares, later periventricular leucomalatia with residual cysts were found.

- At the *corrected age of 40 wks* of PMA she was hypotonic with abnormal extension pattern of posture and movement and showing very poor spontaneous general movement. Fidgety movements didn't develop and abnormal other repertoire persisted. Eye contact was present for a brief time. She had divergent concomitant squint, normal anterior eye segment, clear optic media, a bit hypoplastic and slightly pale optic discs, tortuous vessels, normal retina and foveal reflex, central fixation; low hypermetropia; visual acuity: 6/130 bilateral preferential looking. Electrophysiology 2000: normal ERG, for the age immature flash and pattern VEP, P100 to 3 dg. pattern stimulation was hardly recognisable, negative wave over the left hemisphere.
- *At the age of one year* her functional abilities in movement and self care domain assessed with PEDI were far behind normal development, with some abilities in the social domain.
- *At the age of 2 years* she was diagnosed with cerebral palsy, GMFCS level V, MACS level V; PEDI scores below 10th percentile in self care and movement domains, marked progression in social domain. Communication abilities: able to establish social contact, sends kiss, which means ´yes´ and swings with head for ´no´; responds meaningfully to simple questions. We started with AAC learning.
- *At the age of 3 years* she was able to communicate with some picture symbols.
- *At the age of 5 years* she is able to communicate by voice output system communicator. Divergent concomitant squint is still present, more in the left eye, hardly any convergence; anterior eye segment, optic media without any changes, completely pale, small optic discs, tortuous vessels, normal retina and foveal reflexes with central fixation, no nystagmus; minimal symmetrical relative afferent papillary defect; minimal hypermetropia (+ 0.50 DSPH), no obvious accommodation deficit, visual acuity up to 6/36 pref. looking, better right eye; visual field to the confrontation method – no objective gross visual field defects. Electrophysiology: FVEP of lower amplitude, more in the left eye; PVEP not repeatable to binocular stimulation. There is some response to reversal and onset 50 min. stimulation. Stimulation with bigger 400 min. pattern does not improve the amplitude of the response. The recordings are similar to those in 2003. This time she did fixate the monitor, but her attention was very short.

We found improvement in her communication when her visual abilities are assisted by hearing. She observes her surrounding, enjoys some TV programme. It was suggested to use greater symbols in ACC, avoiding of the crowding phenomena and to search for of the best setting of the communication book, which would enable her to relax her hands and avoid the head retroflexion. She relays a lot on hearing while a person, who is she communicating with, is guiding her through the communication book.

Conclusions: Computers and AAC aids are generally visually based and can be adapted for motor impairment. When visual deficits are added to physical disabilities, different considerations are required to assist in accessing and device use. We believe we found an adequate alternative communication system for this girl, but we still face many problems how to make it better.

EARLY VISUAL PREFERENCES: CONTRAST POLARITY AND LINE TILT

ZGODNJA VIDNA PREFERENCA: POLARNOST KONTRASTA IN NAGIB ČRTE

R. Sireteanu[1,2], I. Bachert[1], R. Rettenbach[1], M. Wagner[1], H. Planert[1], S. Pröhl[1]

[1]Department of Neurophysiology, Max-Planck Institute for Brain Research, Frankfurt, Germany
[2]Department of Biological Psychology, Institute for Psychology, Johann Wolfgang Goethe University, Frankfurt, Germany

Purpose: Infants' spontaneous visual preferences differ qualitatively from those of adult observers. Infants under one year of age do not orient towards a single line or a texture patch consisting of parallel lines oriented orthogonally to the surrounding items (Sireteanu & Rieth, 1992) or to a texture patch consisting of smaller blobs than the items of the surrounding texture (Sireteanu, Encke & Bachert, 2005). We wondered whether the first finding might be due to the fact that target and distractors belonged to the same (oblique) category, while the second might be related to the reduced acuity and contrast sensitivity of the tested infants. Here, we investigate the preference of infants and toddlers to items differing from the surround by a categorial orientation contrast or by a difference in contrast polarity.

Subjects and Methods: We used a modified forced-choice preferential looking procedure. The subjects were 96 healthy, normally-sighted infants between 2 and 12 months of age in four age groups (mean ages 3, 6, 8 and 10 months; 24 subjects/group) and 60 toddlers between 12 and 56 months of age (mean ages 18, 36 and 48 months). The subjects were confronted with pairs of cards on which a target was presented amidst an array of 15 randomly arranged distractors. The tasks used were: "orientation contrast" (a single tilted line amidst an array of vertical lines or a single vertical line amidst an array of tilted lines) and "contrast polarity" (a single dark blob amidst an array of bright blobs or a single bright blob amidst an array of dark blobs on a grey surround).

Results: All groups of infants showed qualitative differences from the adult pattern of preferences. Infants under one year of age did not show a consistent preference for any of the targets, with the exception of the single dark blob. In contrast, children 3 or 4 years of age spontaneously preferred the side of a display containing a deviating item, with a stronger preference for the tilted line and the darker blob. Older children showed a clear preference for the tilted over the vertical line target. The adult pattern of preferences emerged slowly and was not consistent before the end of the first year of age.

Conclusions: These results confirm our previous findings and suggest that it is only after one year of age that the infantile pattern of preferences is replaced by the strong preference for deviating perceptual targets, characteristic of adult vision. This development is paralelled by the emergence, around the end of the first year of age, of novel neural and cognitive mechanisms. Together, these findings suggest that the human brain undergoes substantial remodelling during the transition from infancy to toddlerhood.

References:

Sireteanu R, Rieth C. Texture segregation in infants and children. Behav Brain Res 1992; 49: 133–9.

Sireteanu R, Encke I, Bachert I. Saliency and context play a role in infant texture segmentation. Vision Res 2005; 45: 2161-76.

Acknowledgement: Supported by grants from the Deutsche Forschungsgemeinschaft (Si 344/11–1.2).

THE DEVELOPMENT OF SPATIAL MEMORY IN NORMAL AND ATYPICAL POPULATIONS

RAZVOJ PROSTORSKEGA SPOMINA V ZDRAVI IN NETIPIČNI POPULACIJI

M. Nardini[1], J. Atkinson[1], O. Braddick[2]

[1]Visual Development Unit, University College London, London, The United Kingdom
[2]Dept. of Experimental Psychology, University of Oxford, Oxford, The United Kingdom

Purpose: According to current models, spatial memory and navigation depend on parietal and medial temporal networks specialised for representing different kinds of information, although the development of these is not well understood. We devised a spatial memory task to distinguish between body- and landmark-referenced representations in typically developing 3–6 year old children. These were compared with three clinical groups: individuals with Williams Syndrome (WS), a developmental disorder associated with severe visuo-spatial deficits; children born very prematurely (gestational age 24–32 weeks), and term-born children with perinatal events including asphyxia. Our questions were: 1. Are body- and landmark- referenced representations dissociable over the course of normal development? 2. Could the visuo-cognitive difficulties in WS be explained by an impairment to a particular subsystem of spatial memory? 3. Do preterm children and those at risk of perinatal brain injury show spatial memory impairments consistent with indications of abnormality on MRI?

Subjects and Methods: Children retrieved toys from an array of identical hiding places bordered by landmarks. By walking the child and/or rotating the array, we varied whether the hiding location was consistent between presentation and test, as judged relative to (i) the body, and (ii) the surrounding room. When neither of these frames of reference stayed consistent, only (iii) local landmarks in the array could be used.

Results: In typically developing children, there was evidence for parallel use of body- and room- referenced representations as early as age three years, while the additional use of local landmarks emerged at five years. Children with WS (age 8–15 yrs; mean verbal age 7.4 yrs) scored below the three year old level and combined body and landmark referenced representations in an unusual, non-additive pattern. Although some adults with WS used local landmarks, the WS adults as a group were not above the four year old level. Both children and adults with WS benefited greatly when supplied with a verbal strategy. Preterm and term children

at risk of brain injury showed variable outcome, but a global 1–2 year delay was typical. A minority also showed marked dissociations between body- and landmark-referenced representations. Results from the ongoing analysis of these children's MR images will be discussed.

Conclusions: Our normal data shows distinct developmental trajectories for the use of different frames of reference in spatial memory. In WS, substantial deficits persist to adulthood. These seem to be global. Individuals with WS may be helped in navigational tasks by verbal strategies. Our other clinical groups show more variable outcome, with some preliminary indications of specific deficits consistent with structure-function relationships proposed in adult models. Global deficits could be the outcome either of more widespread injury, or of knock-on effects in which one system cannot develop normally because it receives abnormal input from other systems. Evidence from MRI for these different hypotheses will be discussed

Reference:

http://www.psychol.ucl.ac.uk/vdu/publications.html

Acknowledgement: We would like to thank our clinical collaborators: Drs Francis Cowan, Leigh Dyet, Professors David Edwards, Mary Rutherford. We thank the Williams Syndrome Foundation for their help and participation. Supported by Medical Research Council programme grant G790850.

VISUAL FACTORS IN SPECIFIC READING DISORDER

DEJAVNIKI VIDA PRI DOLOČENI MOTNJI BRANJA

W. V. Gibbons, P. M. Riddell

School of Psychology, University of Reading, Reading, The United Kingdom

Purpose: To investigate the possible role of visual factors in children with specific reading disabilities (SRD). Children and adults with SRD have been shown to have a variety of visual problems. However, these have only been indirectly related to the reading process via the magnocellular deficit theory of dyslexia. A clearer way to demonstrate that deficits in the visual system are causally related to reading difficulties would be to demonstrate poor performance on a measure of reading that stresses the visual system directly. We have therefore developed a measure to determine the degree of internal visual noise in the reading process based on a signal detection method introduced by Pelli (1993).

Materials: Stimuli consisted of blocks of unrelated words in which letters were randomly rotated or randomly spaced vertically in order to introduce visual noise into the text. In this paradigm, small amounts of distortion have no effect on reading rate. It is assumed that these levels of introduced noise are therefore less than the internal noise in the visual system of the participant. However, as the distortion is increased, a point is reached where the time taken to read the text begins to systematically increase with increase in level of distortion. The level of distortion at which time taken to read the text first begins to increase is taken to represent the point at which the added noise begins to exceed the internal noise.

This point is calculated and used as a measure of the equivalent internal noise (EIN) for that participant. A total of 106 male and female participants aged 7–10 were recruited from two local primary schools and from the Dyslexia Research Trust clinic in Reading.

Method: All participants took part in both experiments (where text was randomly rotated and vertically spaced). They read a series of texts at each level of distortion with order of presentation pseudo-randomised for each participant. The time taken to read each text was measured, and this was used to calculate the EIN for each participant in each experiment. The BAS II word reading test was also administered to each participant.

Results: A significant negative correlation was found between reading ability and EIN in the rotation condition. Rotation EIN scores increased significantly as overall reading ability decreased, even when age, non-verbal intelligence and baseline reading rate were taken into account. For vertically spaced text, the correlation was not significant.

Conclusions: These results show that children with reading difficulties appear to have higher levels of internal visual noise, measured during the reading process, when compared to typically developing children. The fact that different results were found for rotated and vertically spaced text suggests that the introduced noise has effects at different points in the reading process.

Reference:

Pelli DG. The quantum efficiency of vision. In: Blakemore C, editor. Vision coding and efficiency. Cambridge University Press, 1993.

VISUAL GUIDANCE OF STAIR DESCENT IN CHILDREN

VID PRI OTROCIH KOT VODILO PRI SESTOPANJU PO STOPNICAH

D. Cowie[1], O. Braddick[1], J. Atkinson[2]

[1]Dept. of Experimental Psychology, University of Oxford, Oxford, The United Kingdom
[2]Visual Development Unit, University College London, London, The United Kingdom

Purpose: We already know that stair descent, an everyday visuomotor task, is hesitant and poorly controlled in typically developing toddlers and is a particular difficulty in certain atypically developing individuals such as those with Williams Syndrome or Developmental Coordination Disorder. Here, we study the development of stair descent by assessing how well children integrate visual information about stair height with motor patterns for stair descent, measuring how they adjust their motor patterns to different stair heights. We aim to determine the kinematic variables which are predicted by stair height for children; and to determine whether the values of these variables become more predictable with age, enabling rapid and reliable descent in adulthood.

Material: A 6-camera motion capture system (SMART, BTS, Italy) was used to obtain kinematic records of stair descent. Participants descended a custom-built flight of 4 stairs (adjustable in height and depth) in the laboratory. Participants were typically developing children aged 4–10 yrs, recruited from volunteer families.

Methods: Children were fitted with 4 reflective markers on each shoe to enable kinematic analysis of their foot trajectories during stair descent. Markers were placed on the heel, toe, and both sides of the foot. For each trial, the child simply walked downstairs at their own pace. Children completed several trials at each riser height. Each child was tested on 3 riser heights, chosen in proportion to their leg length (22%, 25%, 28%).

Results: Preliminary results will be discussed. From kinematic records we quantify several aspects of stair descent. At a broad level we assess the overall cadence of stepping and duration of descent. On a more detailed level we study different phases of stair descent. For example the trajectory of the heel as it rises above a step edge and descends onto the step below has several dissociable phases, each with a given velocity, acceleration, and duration on a given trial. In addition to trajectories of markers we can calculate the clearance of the foot above the stair, which has previously been used to indicate safe-unsafe judgments with regard to a particular stair height. A MANOVA analysis will show the effects of stair height on these kinematic variables, enabling us to determine which kinematic variables reflect judgments of stair height in children.

Conclusions: By determining the kinematic variables associated with visual guidance of stair descent under normal visual conditions, it will be possible to examine more exactly which visual cues are important for stair descent by repeating the study under degraded visual conditions. Furthermore this data from normally developing children will provide a comparison group for the assessment of visually guided stair descent during atypical development. This work will particularly focus on children and adults with Williams Syndrome, and other conditions which show visuomotor disorders such as Developmental Coordination Disorder and apraxia.

Acknowledgement: This work is supported by a Studentship and Programme Grant G790850 from the Medical Research Council, and a grant from the Williams Syndrome Foundation.

EVALUATION OF A NEW PORTABLE SLIT LAMP IN PEDIATRIC PATIENTS

UPORABNOST NOVE PRENOSNE ŠPRANJSKE SVETILKE PRI PREISKAVAH OTROK

M. Beltram, B. Stirn-Kranjc, B. Drnovšek-Olup

Eye Hospital, University Medical Centre Ljubljana, Ljubljana, Slovenia

Purpose: To evaluate (to no commercial interest of the authors) the functionality and ease of use of a novel portable slit lamp in paediatric patients.

Subjects and Methods: Children (1 mth. to 16 yrs.) were examined in a standard clinical setting at the Paediatric Department, University Eye Clinic. The children included in the study presented with different pathology of the cornea, lens, retina or optic nerve. They were examined with a classical slit lamp and the new portable slit lamp. The quality of view and operating convenience were evaluated at the examination of the ocular surface, optic media, ocular fundus.

Results: The binocular portable slit lamp microscope offered clear and easy view of the ocular structures. Its white LED type illumination system with various slit beam size and magnification (8x, 12.5x and 20x) enabled continuous focal view, 3D and wide field observation. An accessory fundus lens provided a high quality viewing of the posterior eye segment. Digital documentation with its own software also offered friendly operability to the examiner and to the children.

Conclusions: The new portable slit lamp in paediatric patients brought benefits in optimal visualisation of the anterior and posterior eye segment, both in supine and prone position.

VIDEOREFRACTOR VS. AUTOREFRACTOR FOR SCREENING OF REFRACTIVE ERRORS IN 6,125 ECUATORIAN CHILDREN: POWER VECTOR ANALYSIS

ANALIZA MOČNOSTNIH VEKTORJEV ZA PRIMERJAVO VIDEOREFRAKTORJA IN AVTOREFRAKTORJA PRI PRESEJANJU 6.125 EKVADORSKIH OTROK ZA REFRAKCIJSKE MOTNJE

M. R. Angi[1], A. Molinari[2], G. Virgili[3]

[1]*Dept. of Neurosciences, Padua University, Padua, Italy*
[2]*Hospital Metropolitano, Quito, Ecuador*
[3]*Dept. of Ophthalmology, Florence University, Florence, Italy*

Purpose: To evaluate the performance of eccentric infrared videorefractor PowerRefractor (PR) for screening refractive errors in a community of Ecuatorian children and for detection of amblyogenic factors. Comparison of the performance of the PR with Autorefractor without cycloplegia (NCAR).

Methods: We examined 6,125 children, aged 5 to 15, from two regions of Ecuatorian highlands. Refraction obtained without cycloplegia with the PR and an AR Canon R-50 was compared with cycloplegic autorefractor (CAR) (gold standard). Cycloplegia was obtained in 73% out of 1,591 children aged 5–6, and in 26% out of 4,534 children aged 7–15, a subsample including 349 children with visual acuity less than 0.5 in at least one eye. A continuous variable to be used as a screening criterion was obtained modelling the vector components of refractive error in multivariate models (power vector) where mild-to-severe refractive error was the dependent variable. "Power vector" model allowed comparison of sensitivity levels obtained by each technique.

Results: Among 1,591 children aged 5–6, mild-to-severe errors were detected with CAR in one eye of 124 (7.8%) children and in two eyes of 209 (13.1%) children. The correlation of both the PR and NCAR with CAR was high for astigmatism and myopia and low for hyperopia. Sensitivity of PR for detecting mild-to-severe refractive errors was 83% and 76%, having fixed specificity at 90% and 94% respectively. The correspondent values for NCAR were 90% and 87%. Nearly all children with severe refractive errors in at least one eye would have referred using the cut-offs by both methods. Older age increased the diagnostic performance of both methods, as did more myopic spherical equivalent.

Conclusions: The PowerRefractor proved to be a valid screening tool for detecting refractive errors in a community of Ecuatorian children, among whom spectacle prescription is a public health priority.

THE EFFECTIVENESS OF CHILD VISION SCREENING 0–7 YEARS IN THE NETHERLANDS

UČINKOVITOST NIZOZEMSKEGA PRESEJANJA OTROK, STARIH 0–7 LET, ZA MOTNJE VIDA

J. H. Groenewoud[1], H. J. Simonsz[2], H. J. de Koning[1],
on behalf of the Rotterdam AMblyopia Screening Effectiveness Study (RAMSES) steering committee

[1]*Department of Public Health, Erasmus MC, University Medical Centre Rotterdam, Rotterdam The Netherlands*
[2]*Department of Ophthalmology, Erasmus MC, University Medical Centre Rotterdam, Rotterdam The Netherlands*

Pupose: To investigate the effectiveness and cost of child vision screening in the Netherlands.

Subjects and Methods: 4,626 children, born between 16 September 1996 and 15 May 1997 in Rotterdam, were included in this prospective cohort study with 7-year follow-up. We collected the results of the routine eye examinations at ages 9, 14, 24, 36, 45–54 and 60 months in Rotterdam child health care. In children under age 3, the eyes were examined with the VOV-method (including the pupillary light reflex, the cover-uncover test, examination of eye movements, and examination of the outer aspect of the eye). In children aged 3 years and older, visual acuity was tested with the Amsterdam Picture Card (younger children) or the Landolt C (older children). In addition, we collected clinical data, including diagnosis and treatment, of children who visited one of the 8 ophthalmological centres in Rotterdam. In 2004, then being around 7 years old, the children were subjected to a final eye examination.

Results: We analysed all vision screening data of around 3,900 children still living in Rotterdam by 2004. Attendance to the routine child health care visits decreased

with age: attendance was about 90% at age 9 months, and about 75% at age 60 months. One out of five children had an abnormal eye examination at least once between ages 9 and 60 months: the number of abnormal eye examinations peaked at age 45–54 months. We received clinical information of about half of the children with an abnormal eye examination. The positive predictive value (PPV) of a positive screening test at ages 9–24 months, followed by an effective referral, was 0.42 (Juttmann et al., 2001); the PPV of a positive screening test at older ages is currently being analysed. Some 2,975 children were seen for a final eye examination. The cumulative incidence of amblyopia in our cohort is estimated at about 3–4%; we are awaiting the prevalence of (residual) amblyopia at age 7.

Conclusions: In this large 7-year follow-up cohort study, we studied the effectiveness of child vision screening in the Netherlands. The final data will be analysed in the forthcoming months. Preliminary results indicate that the Dutch vision screening programme is effective in preventing permanent vision loss. More definite conclusions will be presented at the 2005 Meeting.

REFRACTIVE STATUS OF NORWEGIAN 14 YEAR OLDS WITH LOW BIRTH WEIGHT

REFRAKCIJA PRI 14-LETNIH NORVEŽANIH, KI SO BILI OB ROJSTVU PRELAHKI

S. Lindqvist[1], M. Indredavik[2], J. Skranes[1], T. Vik[3], A.-M. Brubakk[1]

Institutes of [1]Laboratory medicine, Children's and Women's Health,
[2]Neuroscience, and
[3]Community Medicine and General Practice, Norwegian University of Science and Technology, Trondheim, Norway

Purpose: To evaluate the refractive status of two cohorts with low birth weight adolescents compared to a control group with normal birth weight in a population based study.

Material: Participants: 52 adolescents with birth weight < 1,500 g (very low birth weight, VLBW), 59 with birth weight < 10th percentile at term (small for gestational age, SGA) and 77 term controls with normal birth weight examined at 14 years of age. No subjects in the VLBW group had received cryotherapy for ROP; all had a binocular visual acuity (VA) of at least 0.3 or better.

Methods: The adolescent's own correction and optimal correction was recorded. Earlier use of glasses was noted.

Results: All p-values are computed versus controls. VLBWs started using glasses two years earlier than controls ($p = 0.026$). 46% of the VLBWs had ever used glasses, 40% of SGAs and 34% of controls (not significant, n.s.). In all groups, approximately 15% were currently wearing glasses or lenses. Contact lenses were preferred by a third of the SGAs and controls, but not worn by any of the VLBWs ($p = 0.055$). In SGA and controls mean spherical correction was equal in both eyes

(SGAs: +0.3 diopters (D), controls: 0.0 D) (n.s.). In VLBWs, mean spherical correction was +0.4 D in the right eye (n.s.) and +0.6 D in the left eye ($p = 0.044$). Myopia of –1 D (spherical correction) or more in at least one eye was seen in 12% of VLBWs (n.s.) and 10% of controls and SGAs. Hypermetropia of +1 D (spherical correction) or more in at least one eye was more frequent in the VLBW group (22%) than in the control group (7.9%) ($p = 0.034$). The SGAs were hypermetropic above +1 D in 14% of the cases (n.s.). When spherical equivalent was compared, only SGAs were marginally more frequent hypermetropic: 14% versus 3.9% in controls ($p = 0.055$) and 9.8% VLBWs (n.s.). Mean astigmatism was –0.4 for VLBWs (n.s.) and –0.2 for SGAs and controls. 16% of the VLBWs, 5.2% of SGAs and12% of controls had astigmatism of –1 D or more (n.s.). Ranking provided a statistically significant ($p = 0.004$) higher anisometropia (spherical equivalent) for VLBWs than controls, but mean anisometropia was low in all groups (0.3 D for VLBWs and 0.2 D for SGAs and controls). The proportion with a clinically significant anisometropia of 1 D or more was not statistically significantly different in the groups; 6% in the VLBWgroup, 1.7% in SGAs and 3.9% in the controls.

Conclusions: Prematurely born adolescents with VLBW were more often hypermetropic and anisometropic than their peers. Myopia was seen equally often in all groups. SGAs tended toward more hypermetropia than controls.

RESULTS OF LATE ONSET AMBLYOPIA THERAPY IN EXCENTRIC FIXATION

REZULTATI ZDRAVLJENJA KASNE AMBLIOPIJE PRI EKSCENTRIČNI FIKSACIJI

G. C. Gusek-Schneider

Department of Ophthalmology, University of Erlangen-Nürnberg, Erlangen, Germany

Purpose: Excentric fixation on the base of amblyopia remains present in amblyopia therapy. The aim of this study was to describe the clinical entities and the prognosis of therapy.

Subjects and Methods: We investigated the clinical course after long duration facial occlusion therapy and following standard occlusion of 30 children aged under 7 years with the following diagnosis: esotropia: n = 13, microesotropia: n = 6, anisometropia: n = 4, congenital partial clouding of the optical axis: n = 7. Exclusion criteria were diseases of the retina and trauma. Mean age of investigation in the clinic was 62 $\pm$ 14 (32–82), for the patients with partial clouding of the optical axis 28 $\pm$ 14 (9–48), mean follow up time 23 $\pm$ 8 (5–35) months. Standard occlusion therapy before investigation in the clinic had been done in 66% of the children.

Results: Central fixation could be achieved in 10 of 13 children with esotropia, 3 of 6 with microesotropia, 2 of 4 with anisometropia and 1 of 7 with partial clouding of the optical axis. Mean time to achieve central fixation was 3.6 $\pm$ 1.9 (1–9) months.

Visual acuity significantly improved in children with esotropia or microesotropia: Visual acuity at time of first visit in the clinic from 0.06 ± 0.05 to 0.5 ± 0.3, $p < 0.001$ and from 0.09 ± 0.08 to 0.4 ± 0.28, $p = 0.04$, respectively. A significant correlation of finally achieved visual acuity to the time of starting therapy in the clinic only was to see in children with partial clouding of the optical axis ($p = 0.09$): the later the clouding became clinically relevant the better was the prognosis of the visual acuity.

Conclusions: Additionally to the present recommendations for ophthalmological investigations in childhood it must be demanded to test the visual acuity routinely at an age of three. Because of the rareness of partial clouding of the optical axis a cost-effective solution for an ophthalmological investigation (retinoscopy in mydriasis, fixation control) is to be looked for.

DOSE-RATE EFFECTS IN OCCLUSION THERAPY FOR AMBLYOPIA

RAZMERJE MED ODMERKOM IN UČINKOM PRI OKLUZIJSKI TERAPIJI AMBLIOPIJE

M. J. Moseley[1], C. E. Stewart[1], A. R. Fielder[1], D. A. Stephens[2]

[1]*Department of Optometry & Visual Science, City University, London, The United Kingdom*
[2]*Department of Mathematics, Imperial College London, London, The United Kingdom*

Purpose: To compare changes in visual function occurring in response to two prescribed occlusion dose-rates (6 versus 12 hrs/day).

Subjects: Data were obtained from 82 amblyopic children (mean age 5.5 ± 1.5 yrs) participating in the *Randomised Occlusion Treatment for Amblyopia Study* (ROTAS). Amblyopia was associated with strabismus (n = 19), anisometropia (n = 34), and both anisometropia and strabismus (n = 28).

Methods: Seventy-nine subjects required refractive correction and underwent 18-weeks' spectacle wear ('refractive adaptation') before starting occlusion. Seven children gained good and equal visual acuity with refractive adaptation alone. Those subjects whose amblyopia persisted were randomised to receive either 6 or 12 hours occlusion per day. LogMAR visual acuity was assessed at six-weekly intervals during refractive adaptation and at weekly intervals during occlusion until any gains ceased to be statistically verifiable. Participants' patch wear was objectively recorded using an occlusion dose monitor (ODM). Outcomes were defined as follows: logMAR change, residual amblyopia (log units), and the proportion of the amblyopic deficit corrected (%).

Results: Seventy-five children entered the occlusion phase and were randomised to prescribed occlusion doses-rates of 6 hours per day (n = 36), and 12 hours per day (n = 39). Dose-rates actually worn did not significantly differ between groups ($p = 0.06$) (6-hour group: 4.2 ± 1.7, 12-hour group: 6.2 ± 3.9). When grouped according to dose-rates actually worn, 0–3 (n = 19), > 3–6 (n = 32) and > 6–12

(n = 24), significant differences (p = 0.04) in observed changes in visual acuity were shown between the 0–3 group, and > 3–6 and > 6–12 groups (change in logMAR; 0–3 group: 0.18 ± 0.17, > 3–6 group: 0.26 ± 0.19, > 6–12 group: 0.30 ± 0.16). Significant differences in residual amblyopia (p = 0.004) and proportional improvement (p < 0.0001) were also found between the 0–3 group, and > 3–6 and > 6–12 groups (residual amblyopia 0–3 group: 0.31 ± 0.15, > 3–6 group: 0.11 ± 0.11, > 6–12 group: 0.16 ± 0.16; proportional improvement 0–3 group: 33 ± 39%, > 3–6 group: 77 ± 30%, > 6–12 group: 67 ± 33%).

Conclusions: Monitoring actual doses received using ODMs indicates that children who exceed wearing 3 hours per day of patch wear show significantly more improvement than those wearing less than 3 hours per day. Further modelling of the dose-response function has revealed that all dose-rates exceeding 4 hours per day provide essentially similar gains. In order to achieve such dosing, actual dose prescribed must approximate to 6 hours per day.

ACCOMMODATIVE AMPLITUDE AND SUBJECTIVE SYMPTOMS AT NEAR IN YOUNG SCHOOL CHILDREN

AKOMODACIJSKA AMPLITUDA IN SIMPTOMI NA BLIZU PRI MLAJŠIH ŠOLARJIH

B. Sterner, A. Sjöström

Department of Ophthalmology, Institute of Clinical Neuroscience, Göteborg University, Mölndal, Sweden

Purpose: To establish the sufficiency of the ocular accommodation and to characterize accommodative problems and related symptoms among otherwise healthy young school children.

Subjects and Methods: Children from a junior level school were invited to participate in an examination of the accommodative function which was then compared to expected age levels. The amplitude of accommodation was examined using Donders' push-up method. A questionnaire containing four different questions linked to four different subjective symptoms (headache, asthenopia, floating text, facility problems) was also used.

Results: The results showed lower amplitudes than expected in a large group of children and not equivalent to the expected age values. More than one third of the children reported subjective symptoms at near. The incidence of subjective symptoms emerged at the age of 7.5 years and there was significant relationship between low amplitude and subjective symptoms.

Conclusions: Accommodation is not as sufficient in young children as expected. Subjective symptoms emerge at the age of 7.5 years and there is a clear relation between accommodative parameters and these subjective symptoms. Clear standards for diagnosing an accommodative dysfunction need to be further refined.

Because accommodative dysfunctions may result in subjective symptoms, it is of great importance to identify this dysfunction to prevent unnecessary near vision problems.

COLOUR CATEGORISATION IN PRESCHOOL CHILDREN

KATEGORIZACIJA BARV PRI PREDŠOLSKIH OTROCIH

N. J. Pitchford[1], V. Bonnardel[2]

[1]*School of Psychology, University of Nottingham, Nottingham, The United Kingdom*
[2]*Division of Psychology, University of Sunderland, Sunderland, The United Kingdom*

Purpose: Adults easily divide different colour samples into a set of 'basic' colour categories (Berlin & Kay, 1969). Linguistic influences have been shown to operate on adult colour categorisation (e.g., Davidoff, Davies and Roberson, 1999) however preverbal infants also show categorical colour perception across particular boundary points (e.g., Franklin & Davies, 2004). We investigated the role of language in colour categorisation during the preschool years, when children are acquiring colour terms.

Materials: A constrained colour-sorting task was used to assess colour categorisation that required 100 Munsell chips to be sorted into eight basic colour categories. The set of Munsell chips was systematically selected from the most saturated chip available at each of two hue values (5 and 10) for the 10 Munsell hues, at five lightness values (from 8 to 4). A standardised colour vision test (Matsubara, 1957) was used to screen for colour vision defects.

Methods: A group of fifty children (aged 2–4 years) and thirty adults participated in the experiment. Children were sat facing eight boxes on the front of each was a teddy-bear and a focal colour chip corresponding to the [Red], [Green], [Yellow], [Blue], [Purple], [Orange], [Brown] and [Pink] categories. They were told that each teddy-bear collected colours only like the colour on his box. Each chip was presented individually for children to place in a box. Children were then asked to name the eight focal colour chips. This enabled two groups of children to be identified: 'colour namers' flawlessly applied the eight basic colour terms (N = 22, mean age 3.8 years); and 'colour learners' produced more than 25% of naming errors (N = 11, mean age 2.8 years).

Results: Three analyses were performed for each group. First, for each chip the modal category response was determined and referred to the focal colour on the box to which the largest number of participants associated a given colour chip. Results revealed remarkably similarity in colour categorisation across the three groups. Second, hierarchical cluster analysis was performed to determine the emergence of colour categories as partitioning of colour space becomes increasingly refined. Similar partitioning was found across groups for 69% of the chips. However, differences emerged in the later stages of division, as the colour learners (i) made an unconventional division of the [Brown] category, and (ii) traded the

[Red] for a [Turquoise] category, a pattern also shown by adults but not by older children with accurate colour naming. Third, multidimensional scaling analysis enabled the perceptual structure underpinning categorisation performance to be modelled. For each group, two dimensions resulted in the best fit of the data, and these corresponded approximately to red-green (d1) and blue-yellow (d2) colour opponency.

Conclusions: Colour categorisation was remarkably similar across groups and was modelled successfully by the same two colour opponent mechanisms, although variations were observed in the later partitioning of colour space. These results suggest that a perceptual organization of colour categories exists prior to the accurate mapping of colour terms, however linguistic factors may have a later influence on the sharpening of category boundaries.

References:

Berlin B, Kay P. Basic colour terms. Berkeley: University of California Press, 1969.
Davidoff JB, Davies I, Roberson D. Colour categories in a stone-age tribe. Nature 1999; 398: 203–4.
Franklin A, Davies IRL. New evidence for infant colour categories. Br J Dev Psychol 2004; 22: 349–77.

PERCEPTUAL AND COGNITIVE DEVELOPMENT OF COLOUR IN PRESCHOOL CHILDREN BORN VERY PRETERM

RAZVOJ ZAZNAVANJA IN DOUMEVANJA BARV PRI PREDŠOLSKIH OTROCIH, KI SO SE RODILI PRECEJ NEDONOŠENI

S. J. Johnson[1], N. J. Pitchford[2], G. Scerif[2], N. Marlow[1]

[1]School of Human Development, University of Nottingham, Nottingham, The United Kingdom
[2]School of Psychology, University of Nottingham, Nottingham, The United Kingdom

Purpose: Preterm infants are at increased risk for visual impairments (Powls et al., 1997) that have been associated with poor neurodevelopmental outcome (Marlow, 2004). We investigated the effects of preterm birth on perceptual-conceptual processing of colour in preschool children. Previous research by Pitchford & Mullen (2005) has systematically charted the developmental acquisition of colour processing in typically developing full-term children thus enabling detailed quantitative and qualitative comparisons to be made with children born very preterm (i.e., before 31 weeks of gestation).

Materials: Standardised tests of 1) language acquisition (Preschool Language Scale-3, Zimmerman et al., 1992) and 2) colour vision (Infant Colour Plates, Matsubara, 1957) were used to i) assess receptive and expressive language ability from which a measure of language-age was generated and (ii) identify children with colour vision deficiencies. In addition, a series of experimental tasks, designed by Pitchford & Mullen (2005) to measure different aspects of perceptual-cognitive processing of colour were given. These included tasks of perceptual discrimination,

categorisation, preference, comprehension, and naming for each of the 11 basic colours (black, white, red, yellow, green, blue, brown, orange, pink, purple & grey).

Methods: The standardised and experimental tests were given to a group of preschool children that were born less than 31 weeks of gestation, (N = 56, median gestational-age = 28 weeks, mean chronological-age = 44 months, sd = 6.4 months) and performance was compared to that of full-term chronological-age-matched control children, reported previously by Pitchford & Mullen (2002; 2005). Each child was tested on an individual basis at the Nottingham Toddler Lab. Tests were administered in a specified order, over one session lasting approximately one hour.

Results: As a group, the preterm children achieved standardised scores of language development that were within the normal range for test norms (mean = 99.7, sd = 17.7) indicating a normal distribution within this group at preschool age. Furthermore, the tests of colour processing revealed a qualitatively typical developmental trajectory as compared to full-term chronological-age-matched controls. No preterm child was identified with a specific deficit in colour vision, all could discriminate perceptually adjacent basic colours (e.g., blue-purple), and all could sort perceptually different Munsell chips into eight basic colour categories in a similar manner to that shown by full-term controls. Furthermore, preterm children preferred the colours brown and grey less, and learned to comprehend and name these colours at a slower rate, than the other nine basic colours. This finding is consistent with previous research that has shown a selective developmental delay in the conceptualisation of brown and grey (Pitchford & Mullen, 2002; 2005).

Conclusions: This study has shown that during the preschool years, perceptual and cognitive processing of colour develops along a typical developmental trajectory for children that were born very preterm. Longitudinal monitoring is thus required to determine whether for this group of preterm children progression will continue along a typical trajectory or will begin to deviate resulting in later cognitive delay.

References:

Marlow N. Neurocognitive outcome after very preterm birth. Arch Dis Child Fetal Neonatal Ed 2004; 89: F224-8.

Matsubara H. Colour vision test plates for the infants. Tokyo: Handaya, 1957.

Pitchford NJ, Mullen KT. Is the acquisition of basic colour terms in young children constrained? Perception 2002; 31: 1349–70.

Pitchford NJ, Mullen KT. The role of perception, language, and preference in the developmental acquisition of basic colour terms. J Exp Child Psychol 2005; 90: 275–302.

Powls A, Botting N, Cooke RWI, Stephenson G, Marlow N. Visual impairment in very low birthweight children. Arch Dis Child Fetal Neonatal Ed 1997; 76, F82–7.

Zimmerman IL, Steiner VG, Pond RE. The preschool language scale. 3rd ed. San Antonio, TX: The Psychological Corporation, 1992.

SELECTIVE ATTENTION TO CHROMATIC STIMULI IN PRESCHOOL CHILDREN BORN VERY PRETERM

SELEKTIVNA POZORNOST NA BARVNE DRAŽLJAJE PRI PREDŠOLSKIH OTROCIH, KI SO SE RODILI PRECEJ NEDONOŠENI

G. Scerif[1], N. J. Pitchford[1], S. J. Johnson[2], N. Marlow[2]

[1]School of Psychology, University of Nottingham, Nottingham, The United Kingdom
[2]School of Human Development, University of Nottingham, Nottingham, The United Kingdom

Purpose: School children born very preterm suffer from inattention and hyperactivity more frequently than their term peers[1]. However, it is unclear whether these attentional difficulties are apparent during the preschool years and whether they occur independently of sensory deficits associated with retinopathy of prematurity[2], such as lower visual acuity and higher chromatic discrimination thresholds[3]. We investigated generalized attention skills in preschool children born very preterm, as well as selective attention to chromatic stimuli.

Materials: We obtained (1) standardised attention measures using the Leiter International Performance Scale – Revised[4], and (2) computerised measures of visual search for coloured target circles amongst distractors on a touch-screen[5]. Chromatic stimuli varied systematically across different dimensions known to influence perceptual and cognitive processing of colour[6,7]. Target circles were either purple or brown, with the latter known to be conceptualised later in development. These colours were also selected because their differentiation from distractors should not be affected by the chromatic discrimination deficits reported in preterm children[3]. We first compared the effects on search of primary (blue and black) and secondary distractor colours (pink and grey) adjacent to the targets (purple and brown) in colour space. Distractors were matched to the targets in hue distance, saturation and luminance. We then investigated the effects of increases in saturation and luminance of distractors, as these dimensions of colour space affect the discriminability of target stimuli.

Methods: We assessed a group of preschool children born at less than 31 weeks of gestation (N = 31, median gestational-age 28 weeks, mean chronological-age 45.7 months). Administration of the standardised tests preceded collection of the selective attention measures. After a series of demonstration and practice trials, children were asked to first touch target circles presented alone and then targets presented amongst distractors varying in hue, saturation and luminance in a fully counterbalanced order. Comprehension of the corresponding colour terms was then assessed.

Results: Preterm children achieved standardised scores of attention that were within the normal range (means ranging between 9.66–9.9, s.d. = 2.0–3.1). In terms of selective attention, although they comprehend (and name) brown later than other colours[8], they searched for brown as efficiently as for purple across conditions, ($F_{1, 22}$ = 1.426, n.s.). Secondly, when distractors adjacent to targets in colour space were matched for hue distance, saturation and luminance, children searched as efficiently amongst primary (blue and black) as amongst secondary (pink and grey)

distractors, (p = 0.079, n.s., Bonferroni-adjusted). Thirdly, increases in saturation or luminance of secondary (pink) distractors made search for purple targets faster than amongst primary (blue) distractors (p = 0.015, and 0.036 respectively, Bonferroni-adjusted), suggesting that both saturation and luminance contribute to search efficiency. Preliminary analyses suggest that this pattern of performance is consistent with that of full-term chronological-age-matched controls.

Conclusions: This study suggests that during the preschool years attentional control develops along a typical developmental trajectory for children born very preterm, when potential visual processing deficits are accounted for. Longitudinal monitoring is thus required to investigate how attentional deficits emerge later in development.

References:

1. Botting N, Powls A, Cooke RWI, Marlow N. Attention deficit hyperactivity disorders and other psychiatric outcomes in very low birthweight children at 12 years. J Child Psychol Psychiatry 1997; 38, 931–41.
2. Powls A, Botting N, Cooke RWI, Stephenson G, Marlow N. Visual impairment in very low birthweight children. Arch Dis Child Fetal Neonatal Ed 1997; 76: F82–7.
3. Dowdeswell HJ, Slater AM, Broomhall J, Tripp J. Visual deficits in children born at less than 32 weeks of gestation with and without major ocular pathology and cerebral damage. Br J Ophthalmol 1995; 79: 447–52.
4. Roid G, Miller L. Leiter international performance scale – revised. Illinois, USA: Stoleting, 2003
5. Scerif G, Cornish K, Wilding J, Driver J, Karmiloff-Smith A. Visual search in typically developing toddlers and toddlers with fragile X syndrome or Williams syndrome. Dev Sci 2004; 7: 116–30.
6. Pitchford NJ, Mullen KT. Is the acquisition of basic colour terms in young children constrained? Perception 2002; 31: 1349–70.
7. Pitchford NJ, Mullen KT. The role of perception, language and preference in the developmental acquisition of basic colour terms. J Exp Child Psychol 2005; 90: 275–302.
8. Johnson SJ, Pitchford NJ, Scerif G, Marlow N. (submitted). Perceptual and cognitive development of colour in preschool children born very preterm. Programme and book of abstracts. 10th Meeting of the Child vision research society, Bled, Slovenia, June 2005. Ljubljana: CVRS and University Medical Centre Eye Clinic, 2005: 26.

COLOUR PREFERENCE IN INFANCY AND AN ASSOCIATION WITH ORDER OF COLOUR TERM ACQUISITION IN TODDLERS

PRILJUBLJENOST BARV V OTROŠTVU IN NJENA POVEZANOST Z ZAPOREDJEM PRIVZEMANJA NJIHOVEGA POIMENOVANJA

A. Franklin[1], N. Pitchford[2], S. Clausse[1], I. R. L. Davies[1]

[1]Surrey Baby Lab, Department of Psychology, University of Surrey, Guildford, The United Kingdom
[2]Department of Psychology, University of Nottingham, Nottingham, The United Kingdom

Purpose: Pitchford and Mullen (2005) suggest that colour preference and order of colour term acquisition are positively associated. Here, we test this conjecture by measuring colour preference in infants for Belin & Kays' (1969) eight basic

chromatic colours and correlating the preference data with Pitchford and Mullen's toddlers' colour naming data.

Material: Stimuli were coloured squares (12 cm^2) presented on a Sony Trinitron monitor (GDM-F520). The colours were best examples of the eight basic colour categories ((red, green, yellow, blue, brown, pink, orange and purple) as defined in Rosch-Heider (1972).

Subjects and Methods: A preferential looking technique was used to test for colour preference in infants (n = 26, mean age = 24.8 weeks, sd = 5.9). Infants sat on their parent's lap at eye level to and 40 cm away from the monitor. Pairs of colours were presented to the left and right of the infants' midline (12 cm apart). Each stimulus was paired with all other stimuli, and each pairing was shown twice, resulting in 56 trials. The position of the colour was counterbalanced across trials so each colour in the pair appeared on both the left and right. Trials started once the infant was fixated centrally – encouraged by a black and white 'attention getter'. Trials lasted for four seconds. Infant looking was coded blind and on-line.

Results: A repeated measures ANOVA on total looking time, revealed a significant difference across the eight colours, F (7, 175), 6.75, $p < 0.001$. Deviation contrasts revealed significantly longer looking at red (F (1, 25) = 11.37, $p < 0.005$) and orange (F (1, 25) = 4.49, $p < 0.05$), and significantly shorter looking at green (F (1, 25) = 5.88, $p < 0.05$) and brown (F (1, 25) = 25.29, $p < 0.001$), than the overall mean looking time. A repeated measures ANOVA on the percentage of trials for which the colour was looked at first, revealed a significant difference across the eight colours, F (7, 175), 5.48, $p < 0.001$. One sample t tests revealed significantly more first looks at purple (t (25) = 2.12, $p < 0.05$), and orange (t (25) = 2.33, $p < 0.05$), and significantly less first looks at brown (t (25) = 7.13, $p < 0.001$), than chance (50%). The data from the current study was correlated with toddlers' colour naming accuracy scores from Pitchford and Mullen (2005). There were significant associations between colour naming and total looking time, $r = 0.76$, $p < 0.05$, and colour naming and percentage of first looks, $r = 0.81$, $p < 0.05$.

Conclusions: Infants show significant preferences for red, orange and purple and significant aversions to green and brown. Infant colour preference across the eight chromatic colours was found to be associated with colour naming in toddlers. Further exploration of the link between infant colour preference and emerging colour cognition is now needed.

Acknowledgement: Funded by a University of Surrey UREC Pump-Priming grant to the first author.

PRESCHOOL VISUAL AND ATTENTIONAL DEFICITS, RELATED TO BRAIN IMAGING (MRI) AND DEVELOPMENTAL OUTCOME IN VERY PREMATURE INFANTS

MOTNJE VIDA IN POZORNOSTI V PREDŠOLSKEM OBDOBJU GLEDE NA MAGNETNORESONANČNI IZVID MOŽGANOV OB ROJSTVU IN GLEDE NA POTEK RAZVOJA PRI OTROCIH, KI SO BILI ROJENI PRECEJ NEDONOŠENI

J. Atkinson[1], S. Anker[1], D. Birtles[1,2], M. Nardini[1], O. Braddick[2]

[1]*Visual Development Unit, University College London, London, The United Kingdom*
[2]*Dept of Experimental Psychology, University of Oxford, Oxford, The United Kingdom*

Purpose: It is known that significant prematurity is associated with poor visual and cognitive outcome and that infants with PVL (periventricular leukomalacia) show reduced cortical grey matter at term (Inder et al, 1999). From our own previous studies (Atkinson et al 1990, 1991, 1994, 2002) we find that healthy very premature infants, normal on ultrasound and neurological examination, show normal timing for onset of visual cortical function, indicated by a significant visual evoked potential response to orientation-reversal (OR VEP/VERP); infants with abnormalities on ultrasound show a delayed or absent OR-VEP (Atkinson et al, 2002). The purpose of the present study was to monitor longitudinally visual development in the preschool years in a cohort of very premature infants and to relate visuocognitive and attentional problems to brain anomalies identified on neonatal structural MRI.

Subjects: With collaborative teams from the Hammersmith Hospital, London, we studied a cohort (N = 43) of very premature infants (born < 32 weeks gestation, mean 29 weeks), considered from neonatal MRI and birth history to be at high risk of perinatal brain damage.

Method: Infants had serial MRI from birth alongside vision testing (birth to 5 years) using VEP/VERP and behavioural techniques selected for measuring functional onset of visual cortex, and perceptual, spatial, visuocognitive and attentional development. These tests were the ABCDEFV – Atkinson Battery of Child Development for Examining Functional Vision (including core vision tests-orthoptic examination, eye movements, OKN, acuity, accommodation/ refraction, binocularity and additional tests – visuo-perceptual, spatial and cognitive tests, e.g.object permanence, shape matching, embedded figures, block construction copying), together with attentional tests of executive function – Russell Detour Box, Pointing/counterpointing, Day/Night Stroop, Hood Tubes.

Results: Findings indicate that measures for onset of visual cortical functioning (OR-VEP and test of shifting visual attention -fixation shift paradigm), carried out at 2–7 months post term age, provide sensitive 'early surrogate outcome measures' for later neurological status and development. Results from these early tests, ABCDEFV and attentional tests correlated with the severity of abnormality seen on neonatal MRI. Severe deficits on all tests were associated with cystic PVL. A significant number of the premature cohort showed refractive errors, poor binocularity and associated acuity loss A higher incidence of failures were found (including some children with

relatively minor MRI abnormalities) on the spatial and attention executive function tests (related to functioning of parietal and frontal lobe networks).

Conclusions: OR-VEP and fixation shifts tests are potentially useful as early surrogate outcome measures, for predicting plasticity of brain recovery from early damage, allowing early intervention and treatment and can be used to measure efficacy in future intervention trials. Failures on preschool ABCDEFV and executive function tests are likely to be predictive for attentional deficits such as ADHD and other cognitive problems in school and adult life.

References:

Atkinson J. The developing visual brain. Oxford Psychology Series 32. Oxford University Press, 2000.

http://www.psychol.ucl.ac.uk/vdu/publications.html

Acknowledgement: We would like to thank our clinical collaborators: Drs Eugenio Mercuri, Francis Cowan, Leigh Dyet, Professors Lilly Dubowitz, Mary Rutherford, David Edwards. Supported by Medical Research Council programme grant G790850.

DEVELOPMENT OF LOCAL AND GLOBAL PROCESSING IN DORSAL AND VENTRAL STREAMS: AN OVERVIEW

RAZVOJ LOKALNEGA IN GLOBALNEGA PROCESIRANJA V DORZALNI IN VENTRALNI VIDNI POTI

O. Braddick[1], D. Birtles[1,2], D. Cowie[1], S. Anker[2], J. Wattam-Bell[2], J. Atkinson[2]

[1]Dept of Experimental Psychology, University of Oxford, Oxford, The United Kingdom
[2]Visual Development Unit, University College London, London, The United Kingdom

Purpose: Sensitivity to global form and to global motion are dissociable measures of processing in the ventral and dorsal cortical streams. Our earlier work has shown that dorsal stream function shows slower development than ventral in middle childhood, with the dorsal stream showing greater vulnerablility in children with a range of developmental disorders (e.g. Williams syndrome, autism, hemiplegia; Atkinson et al, 1997, 2003; Gunn et al, 2002; Braddick et al, 2003; Guzzetta et al, CVRS 2005). In addition cortical motion processing has a later onset than certain aspects of pattern processing in early infancy. Here we will review the evidence on the relative development of local and global processing in these two domains, from birth to adulthood.

Materials and Methods: Previous studies using visual evoked potentials/event related potentials (VEP/VERP) and behavioural methods have compared the onset of motion and orientation processing, using random-dot motion patterns and oriented grating stimuli, during the first 4 months of life. These stimuli could elicit responses in local direction- and orientation-selective mechanisms. A significant orientation reversal VEP is seen in normally developing infants between 3 weeks and 3 months of age (and is a predictor of later neurological status – Atkinson, CVRS 2005), with a significant VEP for relative local motion between 2–3 months. We have now

developed stimuli to assess infants' detection of global concentric organization, which are geometrically analogous in the motion and form domains. These can be used for both VEP (J. Wattam-Bell et al, CVRS 2005) and preferential looking tests. From 4 years onwards, children's coherence thresholds can be measured using similar displays, and the results compared with earlier work where the form and motion patterns had different structure.

Results: VEP and behavioural measures agree that, although local cortical sensitivity to orientation develops earlier than to directional motion in the first 3 months, responses to global form develop more slowly than those to global motion between 2–5 months. However, for typically developing children between 4–11 years, coherence threshold measurements (D Birtles et al, CVRS 2005) support earlier results with different stimuli showing that over this period, development of sensitivity to global form leads sensitivity to global motion. Studies with new groups at high risk of neurodevelopmental problems, such as infants born very prematurely, extend the findings of dorsal stream vulnerability: in an ongoing study of children born < 32 weeks gestation we also find relatively poor motion coherence thresholds compared to form coherence thresholds.

Conclusions: The results suggest a developmental advantage for global motion over global form processing in normally developing infants, even though local processing develops earlier for form. This implies that extra-striate global mechanisms for motion are functional very soon after cortical directional selectivity first develops. However this motion/form relationship is reversed in the refinement of sensitivity of the global processes in middle childhood. Measurements in this age range show that the motion (dorsal) system is developmentally vulnerable; this vulnerability will be discussed in relation to the sequence revealed by studies of normal development.

Reference:

http://www.psychol.ucl.ac.uk/vdu/publications.html

Acknowledgement: Supported by Medical Research Council programme grant G790850

VEP IN VISUAL PATHWAY MALDEVELOPMENT

VIDNI EVOCIRANI POTENCIALI PRI NEPRAVILNEM RAZVOJU VIDNE POTI

J. Brecelj[1], B. Stirn-Kranjc[1], N. Pečarič-Meglič[2], M. Škrbec[2]

[1]Eye Clinic and
[2]Clinical Institute for Radiology, University Medical Centre Ljubljana, Ljubljana, Slovenia

Purpose: To study visual evoked potentials (VEP) changes in children with visual pathway maldevelopment confirmed with MRI.

Subjects: In four children with optic nerve hypoplasia and achiasmia or chiasmal hypoplasia and/or optic tract hypoplasia, their visual pathway developmental abnormalities were confirmed with MRI and found isolated or concurrent with some other midline abnormalities, such as absence of septum pellucidum, thinning of the corpus callosum, and hypoplasia of the pituitary gland.

Methods: Ophthalmological examination consisted of refraction, near and distance visual acuity, and colour vision testing, fundus examination and Goldmann as well as Octopus perimetry. MRI according to the protocol for septooptic dysplasia was performed, while for electrophysiological assessment, VEP to monocular flash and onset stimulation were recorded by three occipital electrodes. The children were followed-up, two for a longer period – one from the age of 10 months to 9 years, and the other from 1 year to 10 years of age.

Results: All 4 children were referred for electrophysiological assessment because of congenital nystagmus, reduced visual acuity, and optic disc hypoplasia. In two children, one with achiasmia and the other with chiasmal hypoplasia, flash VEP showed crossed asymmetry distribution: to the right eye stimulation, a prominent negative wave around 80 to 100 ms was found over the right hemisphere, and a less distinct positive wave over the left hemisphere, while to the left eye stimulation, the findings were opposite. In one child with the right optic tract hypoplasia, flash VEP showed uncrossed asymmetry distribution: from the right and left eye, the positive wave was found over the right hemisphere, and the negative one over the left hemisphere. VEP features remained consistent throughout the follow-up period. Perimetry showed bitemporal hemianopia in chiasmal maldevelopment and left hemianopia in right optic tract hypoplasia.

Conclusions: In children with congenital nystagmus it is important to electrophysiologically assess the visual pathway function, which is associated with flash VEP crossed asymmetry in achiasmia or chiasmal hypoplasia, and with flash VEP uncrossed asymmetry in optic tract hypoplasia. MRI confirmation of the visual pathway maldevelopment and full ophthalmological assessment, however, are essential.

THE EXTENT OF FIBRE MISROUTING AT THE CHIASM IN ALBINISM

KOLIČINA NAPAČNO KRIŽANIH VLAKEN V KIAZMI PRI ALBINIZMU

D. Thompson, R. J. Leitch, S. Hayton, S. Hardy, A. Liasis, K. K. Nischal, I. R. E. Russell-Eggitt

Tony Kriss Visual Electrophysiology Unit, Eye Dept., Great Ormond Street Hospital for Children, London, The United Kingdom

Purpose: To use pattern VEPs to study the extent of aberrant fibre misrouting in albinism.

Subjects: Eleven patients, who had no manifest nystagmus in the primary position of gaze, were selected from a group who demonstrated a characteristic 'crossed' trans-occipital asymmetry in flash or pattern onset VEP distribution (associated with the chiasmal misrouting in albinism).

Methods: Monocular half field pattern reversal VEPs were recorded from 3 occipital electrodes in response to 50' checks presented in a 14 degree hemifield. The distribution of these responses over the occiput for each eye was compared.

Results: Pattern VEP distribution in 6 patients indicated that both right and left hemi-field stimulation were activating the same hemisphere, but in the other 5 patients hemifield stimulation showed normal activation of each hemisphere. This can be explained by field proportionality if less than 7 degrees of the 14 degree hemifield crossed over. One patient showed a different trans-occipital distribution for each eye, suggesting that the proportion of crossing fibres can be less than 7 degrees in one eye and greater than 7 degrees in one eye and greater than 7 degrees in the other.

Conclusions: Pattern VEP data estimate that less than 7 degrees of visual field may be aberrantly misrouted at the chiasm of albino patients and demonstrates that inter-ocular asymmetries in crossing fibres can occur.

INFANT PATTERN REVERSAL VEPs AND GENDER

VIDNI EVOCIRANI POTENCIALI NA SPREMEMBO VZORCA GLEDE NA SPOL MALČKA

S. Hardy, D. Thompson

The Tony Kriss Visual Electrophysiology Unit, Great Ormond Street Hospital, London, The United Kingdom

Purpose: To investigate gender effects on amplitude & latency in normal infants aged less than 1 year.

Subjects: 136 healthy infants aged less than 1 year were recruited from local health centres & maternity units to participate in a normative data study.

Methods: Pattern reversal VEPs were recorded in 119 awake infants aged 2–51 weeks with parental consent. Gender of subjects was as follows; 67 female (56%) & 52 male (44%). Testing was not possible in 17 infants who were either asleep or too drowsy for pattern VEPs to be recorded. ISCEV standard binocular pattern reversal VEPs were recorded to a range of check sizes when possible (400'–6.25') using 3 occipital scalp electrodes positioned 3 cm above the inion & halfway between this point & R & L mastoid (reference Fz).

Results: The latency of the p1 to all check sizes decreases in the first year of life with the most rapid changes seen in the first 20 weeks. Amplitude changes are more variable but tend to show an increase followed by a gradual decrease with age. Significance testing of gender on p1 latency & amplitude for each check size

tested was performed. No obvious effect of gender was seen for latency or amplitude to any check size (sig. > 0.05) Other variables measured (head circumference & weight) were found to be significant (< 0.05) for gender with boys having larger values for both. Comparisons to previous studies will be made.

Conclusions: Latency and amplitude of the P1 component of the pattern reversal VEP change with age, however no difference specific to gender was found, therefore we conclude that gender specific normal laboratory values are not necessary in this age group.

DEVELOPMENT OF VEPs TO GLOBAL FORM AND MOTION

RAZVOJ VIDNIH EVOCIRANIH POTENCIALOV V ODVISNOSTI OD ZAZNAVANJA OBLIKE IN GIBANJA

J. Wattam-Bell[1], D. Birtles[1,2], O. Braddick[2], J. Atkinson[1]

[1]*Visual Development Unit, Department of Psychology, University College London, London, The United Kingdom*
[2]*Visual Development Unit, Department of Experimental Psychology, University of Oxford, Oxford, The United Kingdom*

Purpose: Global form and global motion are processed separately by the ventral and dorsal visual streams respectively. Previously, we have found that dorsal stream function develops more slowly than ventral stream in middle childhood, and that it shows a specific vulnerability in a variety of neurodevelopmental disorders. However, rather little is know about the relative development of the two streams in infancy. Sensitivity to orientation (form) emerges before sensitivity to motion direction, but these reflect local processing, probably in striate cortex. Global processing, involving integration of local information, occurs in extrastriate areas of the two streams. To explore the early development of global ventral and dorsal stream processing, we have measured visual evoked potentials (VEPs) to global form and motion in infants aged 9–23 weeks, using stimuli that are closely matched along dimensions other than the key form/motion distinction.

Materials and Methods: The form stimulus consisted of dots arranged in short concentric arcs to produce a static global circular pattern. In the motion stimulus the dots moved along similar arcs, resulting in global rotation. These patterns alternated at 1 Hz with patterns in which the dot trajectories were arranged randomly with no global structure. A 1 Hz VEP signal (F1) is a specific response to global organization, while a 2 Hz signal (F2) may arise from local pattern changes.

Results: Infants show a larger F1 for motion than form; this ratio declines with age and averages about one in adults. The ratio shows the opposite behaviour for F2, so the motion advantage is specific to global processing.

Conclusions: The results suggest that in the first 5 months of life, global form processing matures more slowly than motion, even though local processing develops

earlier for form. This contrasts with the more gradual development of global motion processing in middle childhood (Birtles et al & Braddick et al, CVRS 2005).

Acknowledgement: Supported by Medical Research Council programme grant G790850.

AGE-RELATED CHANGES OF CHROMATIC vep IN SCHOOLCHILDREN

SPREMINJANJE VIDNIH EVOCIRANIH POTENCIALOV NA BARVNI DRAŽLJAJ S STAROSTJO ŠOLARJEV

M. Tekavčič-Pompe, B. Stirn-Kranjc, J. Brecelj

Eye Clinic, University Medical Centre Ljubljana, Ljubljana, Slovenia

Purpose: Visual evoked potentials (VEP) to chromatic stimulation are not fully understood and there are very few studies dealing with this topic in children. The aim was to study VEP changes to red-green (R-G) and blue-yellow (B-Y) stimulation in schoolchildren.

Subjects and Methods: Children (7–18 years) with normal colour vision were examined, 30 binocularly and 30 monocularly. Isoluminant R-G and B-Y stimuli were introduced. Isoluminant point was determined for each child subjectively by using heterochromatic flicker photometry, and objectively from recordings. The stimulus was a 7 deg large circle composed of horizontal sinusoidal gratings, with spatial frequency 2 cycles/deg and 90% contrast. VEP were recorded from Oz (mid occipital), O2 (right occipital) and O1 (left occipital) positions. Age-related changes of parameters (latency and amplitude) of the major negative component (N1) to binocular and monocular stimulation were analysed.

Results: Similar age-related changes were observed to R-G and to B-Y stimulation. With increasing age, linear regression of N1 latency and exponential diminishing of N1 amplitude was observed to R-G and B-Y stimulation. Findings to binocular and monocular stimulation were similar for the N1 amplitude, while N1 latency showed age-related linear regression to binocular but not to monocular stimulation.

Conclusions: Our findings suggest that VEP to R-G and B-Y stimulation can be reliably recorded in schoolchildren and show similar age dependant changes. We expect that VEP to R-G and B-Y stimulation can reflect maturation of the parvocellular pathway function.

DEVELOPING TESTS OF ATTENTION FOR PRESCHOOL CHILDREN

TESTI RAZVOJA POZORNOSTI PRI PREDŠOLSKIH OTROCIH

K. Breckenridge[1], J. Atkinson[1], S. Anker[1], O. Braddick[2]

[1]*Visual Development Unit, Department of Psychology, University College London, London, The United Kingdom*
[2]*Department of Experimental Psychology, University of Oxford, Oxford, The United Kingdom*

Purpose: Existing test batteries for assessing children's attention are largely unsuitable for preschool-age children, and older children with certain learning difficulties. Our aim is to develop a new set of tests suitable for children aged between 2.5 and 6 years. Based on the separable aspects of attention proposed and examined by the Test of Everyday Attention for Children (TEA-Ch; Manly et al, 2001), these tests will assess selective attention, sustained attention and attentional (executive) control in the visual and auditory domains.

Materials: Tests include (i) a visual search task, involving identification of target pictures located among similar-looking distractors; (ii) visual and auditory sustained attention tasks, where target words or pictures must be detected in long, continuous strings of non-target words or pictures; (iii) visual- verbal or visual-motor inhibition tasks, where the correct names (verbal response) for pictures of objects or the action (visuomotor response) matching the demonstrated action must be inhibited in favour of the opposite word or action; and (iv) a card sorting task, where successful sorting depends on switching attention between different visual dimensions of stimuli.

Methods: Tests were piloted on children aged between 2.5 and 6 years. Each child completed as many of the tests as was possible given individual time constraints, in an attempt to establish the suitability of the tests across the age range. A group of individuals with Williams Syndrome (a rare genetic disorder characterised by perceptual, spatial-cognitive, and visuomotor abnormalities, often including attentional problems) aged between 7 and 35, also completed selected subtests from the battery.

Results: Preliminary results support the tests as effective measures of visual and auditory attention, showing (i) age-related improvements in typically developing children, and (ii) delayed performance to varying degrees in Williams Syndrome relative to typically developing children, across both visual and auditory domains. This is in line with previous results from our studies of children and adults with Williams Syndrome who show severe problems with spatial and visual executive function tasks, involving parietal and frontal lobes (Atkinson, 2000; Atkinson et al, 2001, 2003).

Conclusions: The problem of testing attention in preschool-age children is addressed via the development of new measures designed and adapted for this age range. Reliable measures of attention in younger children and children of mental age under 6 years will enable easier and earlier identification of attentional problems in conditions such as WS, and will provide evidence for whether the separability of

different components of attention shown in older children (Manly et al, 2001) is also seen in younger children.

References:

Atkinson J. The developing visual brain. Oxford Psychology Series 32. Oxford University Press, 2000.

Atkinson J, Anker S, Braddick O, Nokes L, Mason A, Braddick F. Visual and visuo-spatial development in young Williams Syndrome children. Dev Med Child Neurol 2001; 43: 330–7.

Atkinson J, Braddick O, Anker S, Curran W, Andrew R. Neurobiological models of visuo-spatial cognition in young Williams Syndrome children: Measures of dorsal-stream and frontal function. Dev Neuropsychol 2003; 23: 141–74.

Manly T, Anderson V, Nimmo-Smith I, Turner A, Watson P, Robertson IH. The differential assessment of children's attention: The test of everyday attention for children (TEA-Ch), normative sample and ADHD performance. J Child Psychol Psychiatry 2001; 42, 1065–81.

Acknowledgement: This work is supported by a Studentship from BBSRC and Programme Grant G790850 from the Medical Research Council. We thank the Williams Syndrome Foundation for their help and participation.

ATTENTIONAL DEFICITS IN TWO COHORTS OF 6 YEAR OLD CHILDREN (A) IDENTIFED FROM INFANT VISION SCREENING WITH SIGNIFICANT REFRACTIVE ERRORS (B) BORN PREMATURELY

IZPADI POZORNOSTI V DVEH KOHORTAH 6-LETNIKOV – A) V SKUPINI Z VELIKIMI REFRAKCIJSKIMI NAPAKAMI, ODKRITIMI MED PRESEJANJEM OTROK ZA VIDNE MOTNJE, IN B) PRI OTROCIH, KI SO SE RODILI NEDONOŠENI

S. Anker[1], J. Atkinson[1], K. Breckenridge[1], O. Braddick[2]

[1]Visual Development Unit, University College London, London, The United Kingdom
[2]Department of Experimental Psychology, University of Oxford, Oxford, The United Kingdom

Purpose: Attention is an aspect of visual performance which may be particularly susceptible to developmental disorders. Our earlier work has shown that children who were hyperopic in infancy show a range of visuocognitive and spatial deficits. This study investigated whether these deficits included attentional problems, and whether similar deficits are found in children born very prematurely. We tested (a) a large group (N = 76) of children who were significantly hyperopic (cycloplegic retinoscopy $\geq$ +3.5 D in at least one axis at age 9 months), identified initially by videorefraction in the Cambridge Infant Vision Screening Programme. This group show an increased incidence of deficits in acuity and binocularity; (b) a group (N = 30) of premature infants born at < 32 weeks gestation (as part of a comprehensive investigation of a cohort with neonatal MRI); and (c) a control group (N = 94) of infants who were born within 3 weeks of term and without significant visual or developmental problems.

Material: Four sub-tests of the TEACh test (Test of Everyday Attention for Children) were used to measure attentional ability. They assessed the following domains:

selective visual attention, auditory sustained attention, sustained attention/response inhibition, and attention control/switching.

Method: Children in the three groups each completed the following subtests:
(1) 'Sky Search' assessed visual selective attention in a visual search task
(2) 'Score' assessed sustained auditory attention: children are required to count targets in a long sequence of repetitive sounds
(3) 'Walk don't walk' assesses the ability to inhibit a prepotent visuo-motor response when required, by a sound signal, under increasing time pressure.
(4) 'Opposite world' assesses the ability to maintain inhibition of a visual-verbal association.

Results: The ex-premature group show poorer performance than controls on all subtests, with the least effect in visual search. The children who had been hyperopic in infancy had milder deficits overall, but were significantly poorer than controls on 'Sky search' and 'Opposite world'. The results of t-test comparisons are given in the table.

	Sky targets	*Sky time/target*	*Sky attention*	*Score*	*Walk don't walk*	*Opposite world*	*Same world*
Controls v prematures			< 0.05	< 0.05	< 0.005	< 0.01	
Controls v hyperopes		< 0.005	< 0.05			< 0.01	< 0.005

Conclusions: Our results confirm that measures of visual attention are sensitive indicators of early developmental problems in the neurological and visual domains. The ex-premature group perform worse than the other two groups on these attentional tests with overall deficits across all domains. The hyperopic group as a whole have a greater problem with the visual search task, and perform poorly when required to switch attention. We will discuss the relationship between hyperopes' attentional performance and their other visual and visuo-cognitive deficits (e.g. crowding effects).

Acknowledgement: We would like to thank our clinical collaborators: Drs Eugenio Mercuri, Francis Cowan, Leigh Dyet, Professors Lilly Dubowitz, Mary Rutherford, David Edwards of the Dept of Neonatal Paediatrics, Imperial College School of Medicine. Supported by Medical Research Council programme grant G790850.

DEVELOPMENT OF THE SACCADIC MAIN SEQUENCE

RAZVOJ GLAVNE SAKADNE SEKVENCE

C. Harris[1], F. Budge[1], N. Derbyshire[1], S. Garbutt[2]

[1]SensoriMotor Laboratory, Centre for Theoretical and Computational Neuroscience, University of Plymouth University, Plymouth, The United Kingdom
[2]Department of Physiology and W. M. Keck Foundation Centre for Integrative Neuroscience, University of California, San Francisco, California, USA

Purpose: The ongoing development of new drug therapies for neuro-metabolic diseases places new emphasis on finding quantitative measures of brain function in infancy to monitor neurological disease status from an early age. Saccade pathology is common in these diseases, but difficult to measure in healthy and sick infants. We have previously shown that saccade main sequences can be obtained from optokinetic nystagmus quick-phases in older children with neurometabolic disease. Our goal is to extend this approach to infants by exploring ways to measure saccadic parameters from induced optokinetic and/or vestibular nystagmus quick-phases, as these behaviours can be elicited from birth with minimal cooperation.

Methods: Eye movements are recorded using bi-temporal dc-electro-oculography. We are eliciting nystagmus from infants using either a full-field rotating curtain, a drifting flat-screen pattern, or a rotating Barany chair in the light. Calibration is acquired using either re-fixations to toys or via the VOR with chair rotation.

Results: Preliminary results indicate that the infant main sequence can be measured using quick-phases. At least as early as 2 months of age, saccades have normal or slightly elevated speeds (shorter durations, higher peak velocities) when compared to adults.

Conclusions: Infant saccades are not slow, as has previously been described. Thus, any clinical finding of slow saccades will not be confounded by developmental age. This approach promises to be a reliable way to measure saccades at any age in health or disease.

IS THE DEVELOPMENT OF FIRST- AND SECOND-ORDER MOTION DIFFERENTIALLY AFFECTED BY MONOCULAR VIEWING AND STRABISMUS?

ALI NA RAZVOJ ZAZNAVANJA GIBANJA PRVEGA IN DRUGEGA REDA VPLIVATA MONOKULARNI VID IN STRABIZEM?

D. Thibault[1], O. Brosseau-Lachaine[2], J. Faubert[2], F. Vital-Durand[1]

[1]Inserm 371, Cerveau et Vision, Lyon, Ecole Pratique des Hautes Etudes, IFR 19, Université Claude Bernard Lyon, France
[2]Visual Psychophysics and Perception Laboratory, École d'optométrie, Université de Montréal, Montréal, Québec, Canada

Purpose: Any moving object may contain at least two spatio-temporal components referred to as first- and second-order or as simple and complex components. Detection of first-order motion is defined by a spatial-temporal luminance modulation of the retinal image and can be accomplished by a linear mechanism, while second-order motion is defined by properties such as contrast, texture or depth and requires a non-linear mechanism [1,2]. Psychophysical and physiological evidence suggest the existence of multiple processing channels for each type of motion cue. This study investigates if the development of sensitivity to first and second order motion is affected by monocular viewing in normal controls and in strabismic age-matched infants and children.

Subjects and Methods: Sixty-eight children (8 months to 7 years) participated to the study, 20 were normal controls, 48 were strabismics patients, devoid of any other anomaly, notwithstanding unilateral amblyopia. Sensitivity to stimuli of first- and second-order motion was measured, using a two-alternative forced-choice preferential looking procedure. The best eye of strabismic patients was compared to binocular and monocular data of normal controls.

Results: Motion sensitivity varied as a function of age in the control and strabismic groups and showed a parallel profile of maturation for the two stimuli. The contrast threshold for the second-order stimuli is about 10 times higher than for the first order stimuli. Large inter-individual differences were always observed. In normal controls, binocular and monocular thresholds were similar. In contrast, strabismic children showed delayed maturation and perceptual deficit affecting mainly the second-order processing.

Conclusions: Our psychophysical investigation underlines differences between first and second-order motion processing supporting the existence of two different perceptual mechanisms. Data from the strabismic group confirms a disorder of complex motion perception.

References:

1. Chubb C, Sperling G. Drift-balanced random stimuli: A general basis for studying non-Fourier motion perception. J Opt Soc Am A, 1988; 5: 1986–2007.
2. Cavanagh P, Mather G. Motion: The long and short of it. Spat Vis 1989; 4: 103–29.

Acknowledgment: This research was supported by Fédération des Aveugles et Handicapés visuels de France. O.B.-L. was supported by a travel grant from the FRSQ-Santé, Réseau en santé de la vision.

GLOBAL MOTION AND FORM PROCESSING: RELATIVE DEVELOPMENT BETWEEN 4–11 YEARS AND ADULT

PROCESIRANJE GLOBALNEGA GIBANJA IN OBLIKE: RAZVOJ V STAROSTI 4–11 LET IN STANJE PRI ODRASLEM

D. Birtles[1,2], J. Wattam-Bell[1], J. Atkinson[1], O. Braddick[2]

[1]*Visual Development Unit, University College London, London, The United Kingdom*
[2]*Dept of Experimental Psychology, University of Oxford, Oxford, The United Kingdom*

Purpose: Psychophysical tests of global form and motion processing, designed to assess function in the ventral and dorsal cortical streams, have suggested differential development during childhood and differential vulnerability of the dorsal stream in neurodevelopmental disorders (Atkinson et al, NeuroReport, 1997; Gunn et al, NeuroReport, 2002; Braddick et al, Neuropsychologia, 2003). However, earlier studies have used different layouts for the displays testing global form and global motion. This study used stimuli for form and motion with identical geometry, to remove any incidental differences that might contribute to differential sensitivity. Development of global visual performance was tested in the two domains in school age children (4–11 years) and compared to performance in young adults.

Subjects and Methods: Both form and motion sensitivity were tested with a display which contained, on the left or right side of centre, a circular region of concentrically organized elements. Within this region coherence could be varied by introducing elements with random directions. Elements in the global form test were short arc segments; for global motion they were dots moving along short trajectories forming similar arcs, giving an overall impression of rotational flow. Subjects made a forced-choice judgment of whether the 'ball in the grass' was on the left or right. Thresholds were assessed in an adaptive staircase. 229 school children were tested in groups aged 4–5, 6–7, 8–9, and 10–11 years, and 32 university students.

Results: With these stimuli adults' form and motion coherence thresholds are very similar (mean form = 13%, motion = 17%). Both thresholds decrease with age, but for the youngest group mean motion thresholds are substantially higher (44% vs 28% for form) and the two thresholds converge with increasing age.

Conclusions: Sensitivity to both forms of global coherence continues to improve throughout middle childhood. When tests of global form and motion coherence are equated as closely as possible, motion performance shows a delayed development relative to form. The 'dorsal stream vulnerability' which has been found in a wide variety of disorders is also reflected in normal development and is as marked for tests of rotary global motion as for linear translation.

Acknowledgement: Supported by Medical Research Council programme grant G790850.

DEFICITS OF MOTION PERCEPTION IN CHILDREN WITH PERIVENTRICULAR LEUKOMALACIA

POMANJKLJIVO ZAZNAVANJE GIBANJA PRI OTROCIH S PERIVENTRIKULARNO LEVKOMALACIJO

A. Guzzetta[1], F. Tinelli[1], R. Chillemi[2], A. Bancale[1], G. Cioni[1]

[1]*Department of Developmental Neuroscience, Stella Maris Scientific Institute, University of Pisa, Pisa, Italy*
[2]*Department of Psychology, University of Florence, Florence, Italy*

Background: Disorders of visual functions are common in children with congenital brain lesions, as a consequence of damage involving relevant vision-related structures, such as the optic radiations or the occipital cortex. The most frequently occurring visual abnormalities consist of reduced visual acuity, visual field restrictions and oculomotor disorders; however, new and more subtle types of visuo-perceptual disorders are increasingly recognised in these children. In particular, a consistent disorder of motion perception, as expressed by reduced thresholds for coherent motion, has been recently reported in children with different developmental disabilities and in those with hemiplegia mainly due to focal brain lesions. To date no studies have systematically investigated motion perception in children with other types of brain damage and cerebral palsy.

Purpose: The aim of our study was to assess visual motion perception in children with periventricular leukomalacia to evaluate i) the presence/absence of a specific disorder of motion perception and ii) the correlation with other aspects of visual function.

Subjects and Methods: Twelve subjects with periventricular leukomalacia and 12 normal subjects matched for age were enrolled in the study. There were no differences in the verbal IQ level between the two groups. Detailed assessment of visual function was performed in all subjects, including ophthalmologic examination, visual acuity, visual fields and visuomotor behaviour. Motion perception was assessed by two alternative forced choices (AFC) of direction of motion for different levels of noise corruption displayed on the screen for a limited lifetime (10 frames). Three types of coherent motion were studied: rotational, radial and translational (up-down, right-left) motion.

Results: A deficit in ocular motility was present in 5 subjects (42%), visual acuity defects in 3 (25%) and visual field defects in 1 (8%). In all tests assessing motion perception, children with PVL had worse median values than normal subjects; statistically significant differences were found in particular for the translational (horizontal) and rotational stimuli. No statistical correlation was found between ocular disorders and motion deficits.

Conclusions: As previously described in children with other disabilities and lesions, a specific deficit of motion perception was observed in children with periventricular leukomalacia. This finding supports the hypothesis of a higher vulnerability of the system devoted to motion perception (dorsal system) to early brain damage or dysfunction. No clear correlation has been found between dorsal stream function and other visual abnormalities, suggesting the existence of different neural networks underlying these functions. Further studies are needed to clarify the possible correlation between disorders of motion perception and other aspects of motor, sensory or cognitive function.

Posters / Plakati

Spomnite se na Systane.
Pozabite na suho oko.

Systane™
LUBRICANT EYE DROPS

Novo!

Vlažilne kapljice za suho oko
z dolgotrajnim delovanjem.
Hp-Guar spremeni viskoznost Systane kapljic
kot pridejo v stik z očesom in tako omogoči daljši čas delovanja!

Alcon®

AN ANIMAL MODEL FOR DEVELOPMENT OF SCOTOPIC DOMINANT MECHANISM IN THE VISUAL SYSTEM

ŽIVALSKI MODEL ZA RAZVOJ SKOTOPIČNEGA DOMINANTNEGA MEHANIZMA VIDA

U. Yinon, N. Gurshumov

Physiology Lab., Goldschleger Eye Res. Inst., Tel-Aviv University Faculty of Medicine, Sheba Medical Centre, Tel-Hashomer, Israel

Purpose: It has been previously established that the retina of most mammals is characterized by double visual mechanism: scotopic, responsible for night vision, and photopic, responsible for day vision. In most mammals the scotopic system is dominant. We have tried to outline the development of the above-mentioned mechanisms during the embryonic and postnatal periods and to determine whether our experimental model imitates the retinal function of other mammals with regards to these mechanisms. We characterized the development of dark- and light-adaptation processes, differentiating between the two visual mechanisms.

Methods: The experiments were performed on normal pigmented (DA) rats using electroretinographic techniques, which have long been proven to be an effective and appropriate method for the evaluation of retinal function. The animals were divided into experimental groups according to their age: from first postnatal day (PD) to adult. The electroretinograms (ERGs) were recorded under dark-(scotopic) and light- (photopic) adaptation conditions.

Results: Our results show that the first scotopic response could be detected from the pigmented rat's retina on the 8–9th PD, whereas the first photopic response appears only on the 12–13th PD. Such a difference indicates that the two mechanisms are completely independent. The development of changes in both scotopic and photopic components continues till the 24–25th PD, when the ERG acquires the mature pattern and parameters. The difference between the age groups was statistically significant ($p < 0.001$) for most ERG parameters under both scotopic and photopic conditions. All ERG parameters are characterized by increasing sensitivity with age ($p < 0.001$). In addition, all ERG latency parameters were longer at young age groups ($p < 0.001$) and under photopic conditions ($p < 0.001$).

Conclusions: It has been concluded that there is a difference in the development of the photopic and scotopic components in the rat retina, which depends directly on the dominant retinal mechanism. We suggested, consequently, that our experimental model imitates the retinal function of most mammals and the independent development of the two visual mechanisms. We proved that in rod-dominant mammal the scotopic system appears first, and, therefore, its dominance is reflected not only during the whole life, but also during the maturation of the visual system.

BENEFITS FROM USING FLASH VEP IN CHILDREN AT A PRIMARY CLINICAL LEVEL

BLISKOVNI VIDNI EVOCIRANI POTENCIALI PRI OTROCIH: UGODNOSTI PREISKAVE NA PRIMARNI KLINIČNI RAVNI

E. Gustafsson, M. Mohammadi, A. Sjöström, M. Kraemer

Department of Ophthalmology, Gothenburg University, Sahlgrenska University Hospital/Mölndal, Mölndal, Sweden

Pupose: A retrospective study to evaluate benefits and usefulness of using flashVEP in the examination of children with visual impairment of uncertain ethiology at a primary level ophthalmology clinic.

Subjects: The study was performed at the ophtalmology clinic at Sollefteå Hospital, a smaller Swedish first level hospital serving approximately 41,500 inhabitants, of whom 8,000 are between the age of 0–17. All children referred for ophthalmology assessment in this area were sent here. The criteria for VEP assessment was unclear or subnormal visual ability (SVAS), or failed or delayed visual development (DVM).

Methods: A standardized flash VEP method was used. All children (age 0–17 years, n = 62) examined with VEP between July 2000 and August 2004 where included, and relevant information from their medical records were entered in a database using Microsoft Excel. The database was analyzed regarding aspects of outcome from VEP examination such as whether a diagnose could be established, and if this affected the treatment and future need of care measured as number of visits to the clinic. Comparison between different groups of children where made in order to evaluate any correlation between presenting symptoms, VEP results, occlusion treatment, final diagnose and outcome.

Results: On average, the children came to the eye clinic nearly three times a year (mean = 2.97 visits / year) before the VEP, but only once yearly (mean = 0.99 visits / year) after the examination. One large (n = 28) group of children to benefit where those with visual albinism, who finally could get a more certain diagnose. Another diagnostically important group where the few children where there was a question of whether they had any potential for vision at all. Many of the children received occlusion treatment, and the effect of this varied with the VEP results. Children with normal VEP got the best results (in mean improving their visual acuity 0.013 / month of occlusion), compared to children with VEP-verified visual albinism who improved less (0.008 / month), and those with other findings on VEP (who improved 0.012 / month).

Conclusions: Few of the children who where examined with VEP showed normal results, and we interpret this as an indication to the validity in the selection of those examined. The practice of periodically available flashVEP at a primary level ophthalmology clinic is beneficial, since the examination seldom is very urgent, but gives valuable diagnostic information. The outcome affects the patients positively both in terms of treatment and in terms of number of later visits to the clinic. The

children in question can be difficult to diagnose as well as to examine using traditional methods, and VEP sometimes is the only way to get a diagnose.

ERG AND VEP IN INFANTS AND PRESCHOOL CHILDREN

ELEKTRORETINOGRAM IN VIDNI EVOCIRANI POTENCIALI PRI MALČKIH IN PREDŠOLSKIH OTROCIH

E. Lenassi*, K. Likar*, B. Stirn-Kranjc, J. Brecelj
Eye Clinic, University Medical Centre Ljubljana, Ljubljana, Slovenia

Purpose: To evaluate developmental changes of electroretinograms (ERG) and visual evoked potentials (VEP) in infants and preschool children, and to obtain normative data.

Subjects and Methods: Forty-five healthy children with normal prenatal, natal, perinatal history and development between the age of 1 month and 7 years participated in the study (approved by the National Medical Ethics Committee). The subjects were recruited from the local area through invitations in kindergardens, paediatric clinics and by word of mouth. The results of their ophthalmological examination were uneventful (normal ocular motility with no strabismus, normal anterior eye segment, clear optic media and normal fundi). The refraction was low hypermetropia or low hypermetropic astigmatism in all tested children. The visual acuity was recorded with *Teller Acuity Cards* in infants and with the *Cambridge Crowding Cards* in the rest of the children to get an insight into individual child's visual performance. ERG to white, red and blue flashes, as well as to 30 Hz white flashes were recorded by skin electrodes attached to the lower eyelid in alert infants; pupillary dilatation was not induced. VEP to white flashes, pattern reversal, and to pattern onset stimulation (check sizes 25', 50', and 100') were recorded binocularly and/or monocularly by three electrodes applied to the posterior scalp.

Results: Flash ERG were found to be of longer latency and lower amplitude in infants than in older children as expected. Pattern reversal VEP latency decreased rapidly up to six months and than more gradually up to seven years, while pattern reversal VEP amplitude was rather variable. With age, pattern onset VEP decreased in latency, while the amplitude varied. The median values and ranges of all the parameters provide norms with which the ERG and VEP from pediatric patients can be compared.

Conclusion: In children, ERG and VEP parameters significantly change with age. Established age-related normal response ranges are therefore essential for paediatric visual electrophysiological assessment.

*Both authors contributed equally.

CHROMATIC VEP IN CHILDREN – STIMULATION PROPERTIES

VIDNI EVOCIRANI POTENCIALI NA BARVNI DRAŽLJAJ PRI OTROCIH – KARAKTERISTIKE DRAŽENJA

M. Tekavčič-Pompe, B. Stirn-Kranjc, J. Brecelj

Eye Clinic, University Medical Centre Ljubljana, Ljubljana, Slovenia

Purpose: To study VEP properties to chromatic stimuli in schoolchildren.

Subjects and Methods: Children (7–18 years) with normal colour vision and those with congenital anomalous colour vision were examined. Isoluminant red-green (R-G) and blue-yellow (B-Y) stimuli were introduced. Isoluminant point was determined for each child subjectively by using heterochromatic flicker photometry, and objectively from recordings. The stimulus was a 7 deg large circle composed of horizontal sinusoidal gratings, with spatial frequency 2 cycles/deg and 90% contrast. VEP were recorded from Oz (mid occipital), O2 (right occipital) and O1 (left occipital) positions. VEP waveform, distribution, amplitude and latency of the major negative component (N1) were analysed.

Results: Children with normal colour vision showed similar VEP waveform and N1 distribution to R-G and B-Y stimulation, while N1 amplitude and latency differed. N1 amplitude was significantly ($P < 0.05$) higher and N1 latency significantly ($P < 0.05$) shorter after R-G than after B-Y stimulation. Children with congenital anomalous colour vision (deuteranomalia, deuteranopia, protanomalia, protanopia) showed attenuated N1 to R-G in comparison to B-Y stimulation.

Conclusions: It seems that VEP to chromatic stimuli may be reliable enough for further studies on the parvocellular visual system in children.

COLOUR DISCRIMINATION IN CHILDREN WITH AUTISM

RAZLIKOVANJE BARV PRI AVTISTIČNIH OTROCIH

A. Franklin, E. Alder, P. Sowden

Department of Psychology, University of Surrey, Guildford, The United Kingdom

Purpose: Although there is much research on the perceptual abilities of those with autism, little is known about autistics' colour perception. Anecdotal evidence from those with autism suggests that there may be differences in the sensitivity to colour between those with and without autism. We investigate this here, testing accuracy of colour discrimination with a visual search and a two-alternative forced choice task (2-AFC).

Material: For the colour stimulus set, stimulus pairs differed in brightness and hue (e.g., red1 & red2), and pairs were sampled from red, green and yellow regions of colour space. A second set of abstract line drawn shapes was used as a control. Visual search grids had 1 target and 15 distractors, one stimulus from a stimulus pair was the target and the other stimulus was the distractor. For each stimulus pair there were four grids and the location of the target on each grid was randomised. For the 2-AFC task single stimuli were mounted on grey card.

Subjects and Methods: Fourteen children diagnosed with autism (mean age = 10.5 years, sd = 1.8) and fourteen typically developing children (mean age = 8.9 years, sd = 1.4) were tested. One autistic child showed a colour vision deficiency on the Ishihara test for colour-blindness (1980) and was excluded from the study. All children completed the Raven's Coloured Progressive Matrices (Raven, Court & Raven, 1990). For the visual search task, children were instructed to 'find the odd-one-out'. For the 2-AFC task, children were shown one stimulus in a pair, this stimulus was then covered, and after a five second delay children were shown both stimuli in the pair and were asked to identify the original stimulus.

Results: Raven's Matrices scores did not significantly differ for the two groups (t (25) = 0.15, p = 0.88). A Repeated Measures ANOVA on percentage accuracy scores with group (autistic / not autistic), task (visual search / 2afc) and domain (colour / shape) as factors was conducted. There was a significant main effect of domain, with accuracy lower for colour than shape, F (1, 25) = 5.73, $p < 0.05$. There was also a significant interaction between domain and group, F (1, 25) = 4.90, $p < 0.05$. The reason for this interaction was that autistics were significantly better at shape than colour, t (12) = 3.0, $p < 0.05$, whereas there was no difference for those without autism, t (13) = 0.12, p = 0.89.

Conclusions: The results suggest that children with autism may have difficulties discriminating colour relative to shape. It is possible that these difficulties are related to an impairment of the magnocellular visual pathway in autism (see Mine, Swettenham, Hansen, Campbell, Jeffries, Plaisted, 2002), as this pathway is partly responsible for processing differences in brightness. Further studies are needed that use coloured stimuli differing only in brightness and only in hue to test this suggestion.

CATEGORY EFFECTS ON COLOUR JUST NOTICABLE DIFFERENCES (JNDs) IN TODDLERS AND CHILDREN: A CROSS LINGUISTIC COMPARISON

KATEGORIČNI UČINKI NA KOMAJ ZAZNAVNE SPREMEMBE V BARVAH PRI MALČKIH IN OTROCIH: MEDJEZIKOVNA PRIMERJAVA

O. A. C. Wright, I. R. L. Davies, C. Daoutis, A. Franklin, V. Hobbs

Department of Psychology, University of Surrey, Guildford, The United Kingdom

Purpose: To test universal and relativist theories of categorical colour perception. Universalist accounts (e.g. Bornstein, 1976; Franklyn & Davies, 2004) suggest categorical colour perception is innately constrained and occurs in the absence of language. Relativists (e.g. Roberson, 2005) stress the role colour language plays in shaping colour perception. Colour JNDs were estimated for two age groups belonging to two language groups differing in numbers of basic colour terms used. If language shapes colour perception, different patterns of JNDs would be expected in the two language groups, since the region tested included a category boundary marked in one of the languages, but not in the other. Similarly, a differential pattern of performance between the older and younger language groups would provide support for the relativist view.

Material: Stimuli were rectangular blocks of uniform background colour printed on A4 card. A target (the outline of a dog) differing in colour from the background was embedded in one of the corners of each stimulus. Stimulus sets were printed so separation (in L*a*b* units) between target and background varied systematically, making the background more or less similar to the target. There were 4 conditions, measuring JNDs in green, blue, green-blue and blue-green regions of colour space.

Subjects and Methods: Participants were Himba (a Bantu language lacking separate green-blue terms) and English speaking 2–4 year olds and 6–8 year olds. Participants' task was to find the target (dog) embedded in each stimulus and indicate it by pointing. Correct responses led to more difficult subsequent trials, incorrect responses to easier trials. JNDs were established using a simple staircase method.

Results: Participants in both language groups and age ranges showed similar results. In all groups significantly lower JNDs were found at the boundary region than within neighbouring blue and green categories. The performance of the English speaking participants was overall better than that of Himba speaking participants. 6–8 year olds in both language groups performed better than 2–4 year olds.

Conclusions: The results indicate JNDs are lower at the green-blue boundary than within green or blue colour categories for all groups tested. Moreover, the pattern of performance is similar across age and language groups. According to the relativist view the lack of separate blue-green colour terms in the Himba language should result in equal JNDs at boundary and within-category regions - this was not found to be the case. Nor was evidence produced to indicate learning languages with different colour terms produces a differential change in performance between

the age groups tested - also contrary to the relativist view. Linguistic effects may occur later in development. Nevertheless the evidence presented here suggests language is not the origin of the category effect and lends support to universalist theories.

VISUAL PERCEPTUAL DISORDERS IN CHILDREN WITH CONGENITAL HEMIPLEGIA: DORSAL/VENTRAL STREAM SENSITIVITY AND NEUROPSYCHOLOGICAL TESTING

MOTNJE VIDNEGA ZAZNAVANJA PRI OTROCIH S PRIROJENO HEMIPLEGIJO: OBČUTLJIVOST DORZALNE/VENTRALNE POTI IN NEVROPSIHOLOŠKO TESTIRANJE

F. Tinelli[1], A. Guzzetta[1], P. Brovedani[1], A. Bancale[1], J. Atkinson[2], O. Braddick[2,3], G. Cioni[1]

[1]Department of Developmental Neuroscience, Stella Maris Scientific Institute, University of Pisa, Pisa, Italy
[2]Visual Development Unit, University College, London, The United Kingdom
[3]Department of Experimental Psychology, Oxford University, Oxford, The United Kingdom

Purpose: To investigate the potential role of dorsal and ventral stream impairment in relation to different categories of neuropsychological tests and the possible correlation with the site and side of the brain lesion.

Subjects: Twenty-seven subjects (15 male, 12 female) diagnosed as having a congenital infantile hemiplegic CP according to the definition of Aicardi and Bax (1998) were included in the study. The age at testing ranged from 4 years and 1 month to 16 years and 1 month (mean = 7.9).

Methods: In all children two sets of tests were administered: (1) a psychophysical battery consisting of a motion coherence and a form coherence test (Atkinson, 2000); (2) a visuo-spatial battery consisting of four neuropsychological tests – the Visuo-Motor Integration test (VMI), the Picture Completion test (PC), the Judgement of Line Orientation test (Lines), and the Block Design test (Block) – plus the assessment of performance IQ by means of the Weschler scales. One of the tests (Benton's lines) was not performed in 6 of the 27 children, as they were not in the age range of standardisation.

Results: Six out of 27 (22%) children showed abnormal results on the form coherence task while 10/27 (37%) children showed abnormal results on the motion coherence task. On the neuropsychological tests abnormal results were distributed as follows: PIQ 6/27 (22%), VMI 6/27 (22%); PC 2/27 (7%); Block 4/27 (15%); Lines 8/21 (38%). The results of the correlation between the z scores in all the tests assessed were: form sensitivity was significantly correlated to performance IQ score and to VMI test; motion sensitivity was significantly correlated with Block design test. In particular while in the VMI test and in the PIQ children with

abnormal motion sensitivity and normal form sensitivity showed worse performances than those with only abnormal form, in the Block and the Lines, the opposite pattern was observed. No clear correlation with site or type of MRI features of the brain lesions was found.

Conclusions: The results confirm a high incidence of visuoperceptual and visuospatial difficulties in children with congenital brain damage and hemiplegia. Although selective correlations can be identified between the single tests and ventral/dorsal stream functions, both systems are involved in visual processing, with different degrees of contribution. The assessment of dorsal and ventral stream sensitivity can therefore provide important cues for the interpretation of these deficits and their treatment.

A DEVELOPMENTAL MODEL OF CONGENITAL NYSTAGMUS

MODEL ZA RAZVOJ PRIROJENEGA NISTAGMUSA

C. Harris[1], D. Berry[2]

[1]*SensoriMotor Laboratory, Centre for Theoretical and Computational Neuroscience, University of Plymouth, Plymouth, The United Kingdom*
[2]*Departamento de Física, Colégio Luis Verney, Universidade de Évora, Évora, Portugal*

Purpose: Congenital nystagmus (CN) is a spontaneous oscillation of the eyes with an onset in the first few months of life. In 90% of affected children there is an associated underlying sensory defect (foveal hypoplasia, cone dysfunction, cataracts, etc.). In 10% no underlying visual defect can be found, and the nystagmus is labelled as 'idiopathic'. CN appears to be a developmental anomaly of sensorimotor integration, as it is not have an onset later in infancy or beyond, but why such a wide variety of early onset visual defects should lead to life-long oscillation of the eyes is a mystery. Previous models have focussed on a systems level approach to explain *how* CN might be generated by known oculomotor circuits. We ask, instead, *why* CN might occur.

Model: Our basic tenet is that infant visuomotor development is highly plastic during some early 'critical' period. A defect of foveal vision occurring during (and only during) this period leads to an anomalous connectivity in the oculomotor circuitry, which becomes permanent thereafter. We propose that circuitry normally used for precise foveal registration of a visual object (gaze holding, fixation, and smooth pursuit) develops to maintain some degree of image motion, as this would maximise contrast for a low spatial frequency system. However, this motion is in conflict with maintaining the image on the fovea (or its remnant). We explore the best oculomotor strategy to cope with this conflict.

Results: The optimal strategy (in the least squares sense) is to oscillate the eyes in one meridian with alternating slow and quick (saccade) phases. Remarkably, the optimal waveform profile has an increasing-velocity profile. Many of the unique waveforms seen empirically in CN are also optimal strategies given realistic

uncertainty in the initial position of a slow phase. Using non-linear dynamical systems analysis, we show that these 'optimal' oscillations have similar fractional correlation dimensions to observed data. We also show that a 'null region', as commonly observed in CN, would be an inevitable consequence of a velocity driven oculomotor system.

Conclusions: We have developed a new approach to understanding oculomotor development, in which we examine the best strategy to maximise visual contrast. In a normal foveate visual system with fine oculomotor control, the best strategy is to develop good foveal registration, which we call 'fixation', and 'smooth pursuit'. If, however, the fovea is absent or not being stimulated (eg. cataracts), the best strategy would be to develop oscillations of the type seen in CN. It implies that the chaotic oscillations are the result of a physiological developmental adaptive process. This is in contrast to the prevailing view that CN is a disease that can be 'cured'. It is not surprising that CN has proven remarkably refractory to therapeutic intervention with only minimal (if any) long-term successes using drugs, surgery, or even biofeedback. We argue that CN is as adaptive and permanent as normal eye movements are in a normally sighted individual.

DEVELOPMENT OF PURSUIT EYE MOVEMENTS IN THREE DEMENSIONAL SPACE

RAZVOJ SLEDILNEGA GIBANJA OČI V TRIDIMENZIJSKEM PROSTORU

J. Fukushima[1], H. Saito[1,2], T. Maruya[1], N. Sawada[1], M. Kawanishi[1], K. Fukushima[2]

[1]*Department of Health Sciences and*
[2]*Department of Physiology, Hokkaido University, School of Medicine, Hokkaido, Japan*

Purpose: To maintain optimal clarity of objects moving slowly in 3-dimensional space close to the observer, pursuit eye movements are necessary that consist of smooth-pursuit and vergence; smooth pursuit system moves left and right eyes in the same direction, while the vergence system moves in the opposite direction. The purpose of this study is to investigate development of pursuit eye movements in children.

Subjects: Twenty-five healthy children aged 5~14 participated in this study. Informed consent was obtained from each subject and parent. Twenty-three adults aged 20~34 were examined as controls.

Methods: Subjects were asked to sit in front of a computer display with their head restrained. A 0.5 deg spot moved sinusoidally at 0.2 Hz horizontally or vertically. For a vergence task, LCD shuttered glasses were used to present a spot in 3-D virtual space. Subjects were instructed to pursue the target. To examine effect of distractor, two different kinds of background, homogeneous or textured with random dot patterns, were presented on the display during target movements as previously described (Takeichi et al. 2003). To examine how pursuit velocity is maintained

during brief blanking of a retinal target, the target was extinguished for 200 ms during the movements. Eye position signals obtained by infrared system and target signals were digitized. After excluding saccades, a sine function was fitted to velocity traces to obtain gains (eye velocity/target velocity). The data with harmonic distortion > 0.5 or S/N ratio < 1.0 were excluded (Wilson et al. 1984).

Results: All subjects including children were cooperative and accomplished the tasks. However, we had to discard some data of children because they did not satisfy the above criteria. Children showed lower gains than adults in both horizontal and vertical smooth pursuit. Children aged 7~12 showed asymmetry between upward and downward pursuit velocity. They also showed lower gains in vergence eye movements, compared with those of adults. Although both children and adult groups showed decreased gains during pursuit across the textured background compared to the gains across the homogeneous background, the reduction was higher in children than adults. When the target was extinguished for 200 ms, children showed lower velocity than adults during and after the target blanking. Performances of some children aged 14 were similar to those of adults.

Conclusions: Children under 12 years old exhibited poor pursuit performance compared to adults for target motion in both frontal and depth directions particularly under demanding task conditions as tested in this study for pursuit across the textured background and target blanking.

CATARACT SURGERY AND INTRAOCULAR LENS IMPLANTATION OUTCOME IN CHILDREN AGED 5 AND UNDER

VID PO OPERACIJAH KATARAKTE IN VSTAVITVI ZNOTRAJOČESNIH LEČ PRI OTROCIH, STARIH DO 5 LET

V. Pfeifer, B. Stirn-Kranjc, M. Tekavčič-Pompe

Eye Clinic, University Medical Centre Ljubljana, Ljubljana, Slovenia

Purpose: to determine the visual outcome and complication rate in cataract surgery with intraocular lens (IOL) implantation in children aged 5 and under.

Subjects: The charts of all children aged 5 years and under, who had undergone cataract surgery with posterior chamber IOL implantation in our hospital between January 2000 and November 2004 were reviewed. All surgeries were performed by the same surgeon. Mean follow-up was 16 months (in the range between 8 and 60). 13 children, 5 monocularly and 8 binocularly affected (21 eyes), were eligible for inclusion in our study. Children with uveitis, aniridia, persistent hyperplasic primary vitreous and microphthalmos were not included.

Methods: Surgical technique was the same in all children and consisted of: anterior continuous curvilinear capsulorrhexis (CCC), cataract aspiration, posterior CCC, anterior vitrectomy and in the bag IOL implantation with optic capture.

Results: Cataracts were congenital in 9 and juvenile in 12 affected eyes. The median age at surgery was 37 months (range 6–60 months). Of 16 affected eyes (of 8 children with bilateral disease), 10 eyes (62%) had a final best-corrected visual acuity of 0.5 or better, while 6 (38%) achieved 0.4 or less. Of 5 affected eyes (of 5 children with unilateral disease), 1 eye (1/5) had a final best-corrected visual acuity of 0.5 or better, while 4 eyes (4/5) achieved 0.3 or less. Reoperation was required in 2 of 21 eyes. In the first anterior synechia to the surgery wound was released and in the second the intraocular lens became opacified 3.5 years after the surgery and needed to be exchanged. Glaucoma, endophthalmitis or retinal detachment have not been observed so far in any child postoperatively. No obstruction of optical axis was noted due to other factors than IOL opacification.

Conclusions: In this series of children aged 5 and under cataract surgery with anterior and posterior CCC, anterior vitrectomy, in the bag IOL implantation and optic capture showed to be a safe procedure with good visual outcome, especially in children with binocular cataracts.

ACKNOWLEDGEMENT / ZAHVALA

to the exhibitors / razstavljalcem:

Alcon, Podružnica Ljubljana, Erjavčeva 4, 1000 Ljubljana
Optotek d.o.o., Stegne 13 A, 1000 Ljubljana
Pfizer Luxemburg SARL
Pfizer, Podružnica Ljubljana, Letališka cesta 3, 1000 Ljubljana

to advertisers / oglaševalcem:

Alcon d.o.o.
Novartis Ophthalmics
Optotek d.o.o.
SensoMotoric Instruments GmbH

for the support / za podporo:

Republic of Slovenia Ministry of Education and Sport, AARS

AUTHORS INDEX / AVTORSKO KAZALO

SVET JE LEP > GLEJMO GA

Brezskrbno v naravo

NOVARTIS OPHTHALMICS

ZADITEN®
ketotifen fumarate

ŠIROK TERAPEVTSKI IZBOR | MREŽNICA | GLAVKOM | **ALERGIJA** | SUHO OKO | VNETJE |

Bistvene informacije iz povzetka temeljnih značilnosti zdravila

Ime zdravila
Zaditen 0,25 mg/ml kapljice za oko, raztopina
Kakovostna in količinska sestava
1 ml raztopine vsebuje 0,345 mg ketotifen hidrogenfumarata, kar ustreza 0,25 mg ketotifena.
1 kapljica vsebuje 8,5 µg ketotifen hidrogenfumarata.
Terapevtske indikacije
Simptomatsko zdravljenje sezonskega alergijskega konjunktivitisa.
Odmerjanje in način uporabe
Odrasli, starejši in otroci (od 3. leta dalje): ena kapljica Zaditena v veznično vrečko dvakrat na dan. Vsebina v kapalni plastenki ostane sterilna, dokler originalne zaporke ne pretrgate. Da ne bi prišlo do kontaminacije, pazite da se s konico kapalne plastenke ničesar ne dotaknete.
Kontraindikacije
Preobčutljivost za ketotifen ali katerokoli od pomožnih snovi.
Posebna opozorila in previdnostni ukrepi
Kot večina kapljic za oko tudi Zaditen vsebuje konzervans benzalkonijev klorid, ki se lahko adsorbira na mehke kontaktne leče. Zaditena se zato med uporabo mehkih kontaktnih leč ne sme vkapljati. Kontaktne leče je potrebno pred uporabo kapljic za oko odstraniti. Ponovno se jih lahko vstavi šele 15 minut po uporabi Zaditena.Vse kapljice za oko, ki vsebujejo konzervans benzalkonijev klorid, lahko spremenijo barvo mehkih kontaktnih leč.
Medsebojno delovanje z drugimi zdravili in druge oblike interakcij
Če uporabljate še druga zdravila za oko, med uporabo enega in drugega zdravila počakajte vsaj pet (5) minut. Uporaba peroralnih oblik ketotifena lahko stopnjuje učinke depresorjev centralnega živčevja, antihistaminikov in alkohola. Čeprav teh učinkov pri Zaditenu niso opazili, jih med njegovo uporabo ni mogoče izključiti.
Neželeni učinki
Pri priporočenih odmerkih so opazili naslednje neželene učinke:
Neželeni učinki na oko: Med 1 in 2 %: pekoč občutek/zbadanje, točkaste erozije epitelija.
Manj kot 1 %: zamegljen vid po vkapljanju, suhe oči, motnje vek, konjunktivitis, bolečine v očeh, fotofobija, subkonjunktivalna krvavitev.
Sistemski neželeni učinki: Manj kot 1 %: glavobol, zaspanost, kožni izpuščaj, ekcem, urtikarija, suha usta in alergijske reakcije.
Način in režim izdaje zdravila
Zdravilo se izdaja le na recept. Zdravilo je razvrščeno na pozitivno listo zdravil.
Imetnik dovoljenja za promet
Novartis Pharma GmbH, Roonstrasse 25, 90429 Nuremberg, Nemčija

Podrobnejše informacije so na voljo pri:
Novartis Pharma Services Inc.
Tivolska 30, 1000 Ljubljana

ZAD-AD-05/05-SI